THE WELDING ENGINEER

DECEMBER, 1953 35¢

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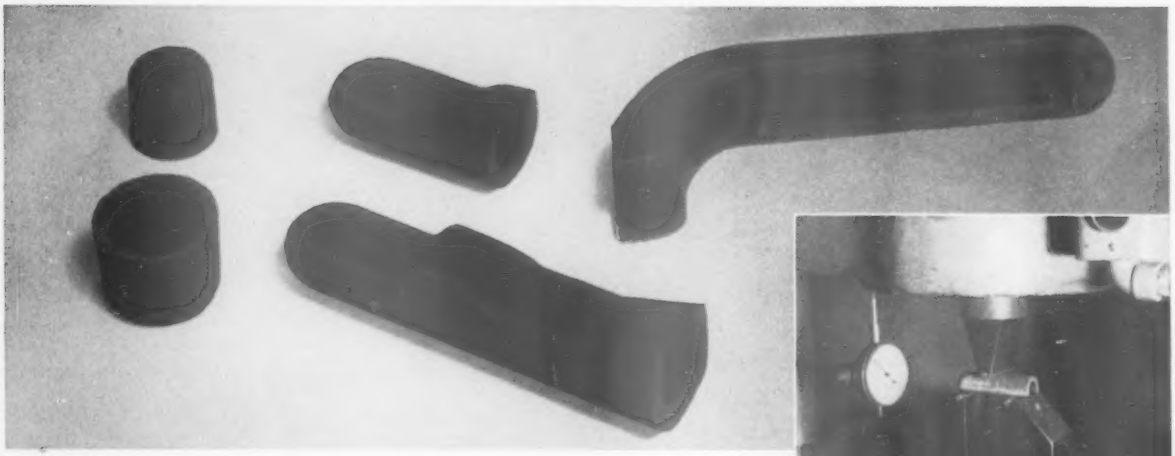
A McGRAW-HILL PUBLICATION



Newly Developed Fiber Glass Insulation gives longer trouble-free life to Jackson Holders

High heat, and, in many cases, high impact, make jaw insulators the most vulnerable parts of any arc welding electrode holder.

Jackson Products, pioneer manufacturer of insulated electrode holders, has time and again brought out worthwhile improvements in both the design and composition of holder insulators.

This time, here's the news: Not only the jaw insulators, but all the insulators on the entire line of Jackson Insulated Holders, are now made of an entirely new thermosetting material, all glass fiber reinforced, that exceeds in durability, by a wide margin, any material so far used for this purpose.

As a constant check on their quality, we have these insulators periodically tested by independent laboratories . . . not just sample bars of the same material, but the actual jaw insulators, completely fabricated, countersunk screw holes and all.

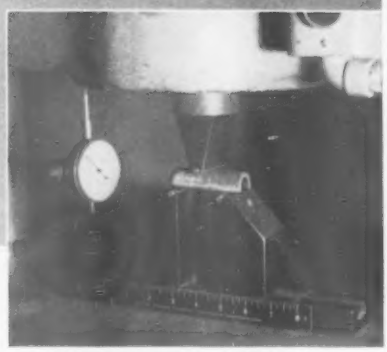
Compared to the jaw insulators previously used, these new pieces show greater strength under compression, more than twice the strength under flexure, and more than eight times the strength under impact. Electric furnace tests at temperatures of 500, 1,000 and 2,000° F. prove that the new Jackson Insulators retain their shape and their full insulative characteristics at temperatures well above those normally encountered.

More good news: These superior insulators are furnished on the holders at no extra cost, and as replacement parts at no increase in price. They still cost less than other makes.

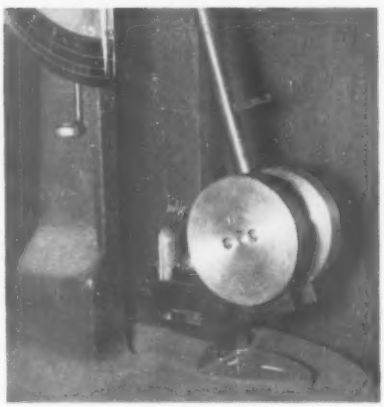
New Holder AW-C with the new insulation, shown in detail above.

Sold World Wide . . . through Distributors and Dealers.

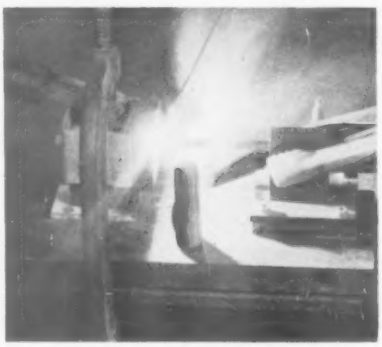
JACKSON
PRODUCTS
WARREN · MICHIGAN



FLEXURE TEST shows insulator, supported two inches apart, with load applied downward at the center.



IMPACT TEST shows insulator, held vertical in vise, about to be hit by pendulum at 16 foot-pounds.



The CARBON ARC TEST is part of continuous quality control at Jackson's Plastics Department. The 1,300° F. heat applied by this method, at a distance of two inches from the test pieces, is comparable to the temperature normally radiated by two-inch electrode stubs.

Cut Your Costs with the New HOBART arc welders

Here's a line of welders that will speed production, cut costs on the toughest production or construction jobs and give you top welder performance. The best proof of Hobart's bigger values — is a comparison with others.

GAS DRIVE MODELS — are most complete welder units available. Have push button starters, fly ball governor, idling device, 1 — 3 or 12 KW auxiliary power outlets, multi-range dual control, remote control, 300, 400, 600 amp. capacity.

NEW "HUSKY BOY" — a 200 ampere, air cooled, gas driven welder. Designed to meet general shop and outside repair work. Does a real job on profitable emergency service. Can be easily moved on pick-up truck.

ELECTRIC DRIVE MODELS — for production maintenance and repair welding in both large and small plants. "Simplified" controls insure quality welding with greater speed. A size for every job. Available in 200, 300, 400 and 600 amp. capacity.

Try this **HOBART #10 electrode E-6010**

FREE samples on request

It's an all-position, general purpose electrode, ideal for pipe lines, structural steel, boilers, tanks, ship building, freight cars, etc. Gives stronger welds, deeper penetration and less spatter.

Use coupon for samples.

Hobart "One of the world's largest builders of arc welding equipment."

HOBART BROTHERS COMPANY, Box U-123, TROY, OHIO

Please send without obligation information on items checked below:

☐ Electric Drive Welder ☐ Husky Boy ☐ Gas Drive Welder

Send me:

☐ Welder Cat. ☐ Electrode Cat. ☐ Accessory Cat.

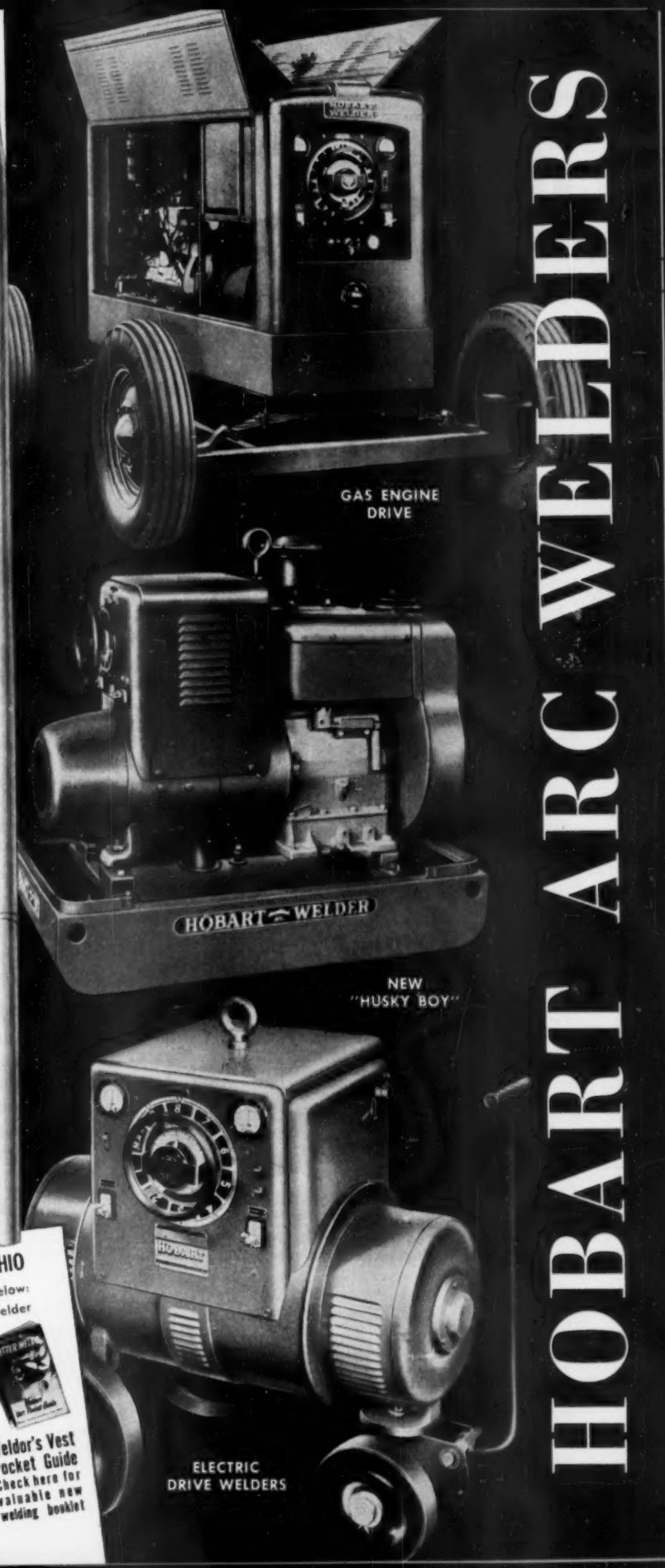
☐ Send me FREE sample of #10 Electrode (E-6010)

NAME _____ POSITION _____

FIRM _____

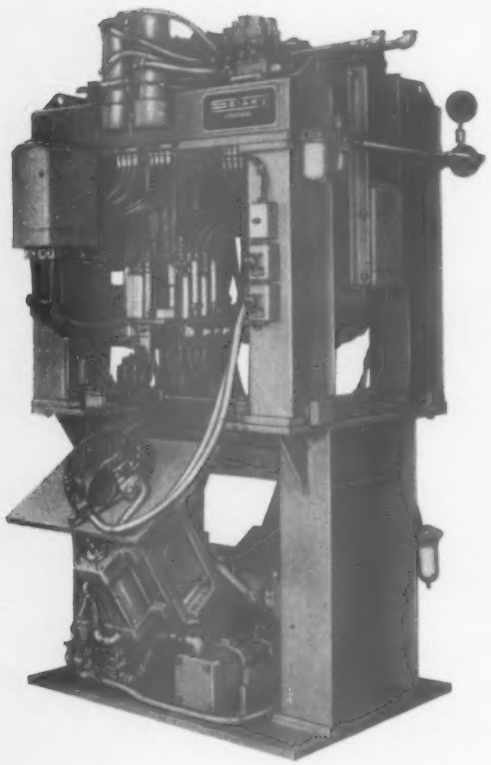
ADDRESS _____

☐ **Weldor's Vest Pocket Guide** Check here for valuable new welding booklet



HOBART ARC WELDERS

NEW
HIGH PRODUCTION WELDER
READILY ADAPTABLE TO
PRODUCTION CHANGES



The Sciaky Standard SX Electric Resistance Welder equipped as a 36 Gun Unit for welding blower housings at the rate of 500 per 50 minute hour.

New Sciaky Standard Multiple Gun Welder Designed for Wide Variety of Production Applications

High production, multiple gun applications no longer require uneconomical C-frame type electric resistance welding machines with special tooling, or complex, specially designed, one-job machines.

Now, Sciaky, pioneers and inventors of electric resistance welding machines, offers a standard multiple gun welder that can be readily adapted for production changes within the capacity of the machine.

The Sciaky SX Welder, a dual platen unit, mounts simple superstructure providing for different arrangements of standard transformer, booster, and welding electrode units.

With approved J. I. C. controls, and featuring either independent or simultaneous dual platen operation, the Sciaky SX Welder offers all the advantages of high production, precision welding, *plus* the tremendous economies of adaptability to production changes.

For complete information, write for Bulletin 313-12.

Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

Plants: Chicago • London • Paris Sales Offices: Chicago, Ill. • Buffalo, N. Y. • Cleveland, Ohio • Dayton, Ohio • Detroit, Mich. • Ft. Worth, Texas • Hollywood, Calif. • New York, N.Y. • Philadelphia, Pa. • Washington, D.C.

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DECEMBER, 1953

Cover: *Wooden platforms keep weldors working near Engadine, Mich., from sinking into water-soaked ground. One hundred miles of this newly completed pipeline ran through swamps—see "Toughest Pipeline" beginning on page 54. Photo courtesy Detroit Diesel Engine Div., General Motors Corp.*

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BLUEWELD

Aridair

ELECTRODE

Moisture Content

STABILIZER

worth its weight in gold

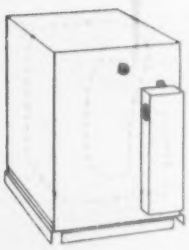
FOR

Low Hydrogen

and

Stainless Steel Electrode Arc Welding Applications

Specifically designed and engineered to maintain correct moisture content.



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Fred C. Archer, Inc.

MANUFACTURER

MILWAUKEE 3, WISCONSIN

MORE than 12,000 persons attended 41st Safety Congress and Exposition, held Oct. 19-23 in Chicago. Safety supplies for welding were prominently displayed in many of the 237 exhibits. Seven hotels housed over 200 sessions

NEWS

41st Safety Congress Had 186 Exhibitors

CHICAGO and the National Safety Council played host to approximately 12,000 visitors at the 41st National Safety Congress and Exposition, Oct. 19-23. The exposition included 186 exhibitors, who set up 237 displays.

The week-long meeting included more than 200 sessions held at the Conrad Hilton, Blackstone, Congress, Hamilton, LaSalle, Morrison and Palmer House hotels. These meetings covered safety in all phases of our existence—at work, in the home, on the farm, on the streets.

Among exhibitors who make safety appliances for welding and allied industries were the following: American Chain & Cable Co., Ampco Metal, Inc., Bausch & Lomb Optical Co., E. D. Bullard Co., Chicago Eye Shield Co., Diversey Corp., Dockson Corp., Pennsylvania Optical Co., Pulsoman Safety Equipment Corp., Racine Glove Co., Inc., Sellstrom Mfg. Co. and United States Safety Service Co.

* * *

Victor Equipment Co. Buys Adams Alloy Co.

WITH the recent purchase of Adams Alloy Co., Wakita, Okla., Victor Equipment Co., San Francisco, acquired a permanent source of hardfacing rod and special castings. The transaction also added four additional types of hardfacing rods to the Victor line.

Victor bought all of Adams' outstanding stock in exchange for 10,000 shares of Victor common stock. Adams products had been sold by the California firm for the past several years. Victor entered the hardfacing industry four years ago when it purchased Mill Alloy, Inc., Los Angeles.

Cliff Adams, vice-president of Adams Alloy, will continue with the new organization as vice-president of sales.

* * *

Weldox Moves to Larger Quarters

THE Weldox Equipment Co., Inc., independent distributor of welding equipment and compressed gases, recently moved to 543 E. 75th St., near East River Drive, New York City. The new quarters measure 62 by 100 ft. The firm had outgrown its previous location at 361 W. 52nd St.

In order to facilitate loading and unloading, the new site will have a heavy-duty hoist capable of raising 100 cylinders to any required truck level.

* * *

Jacket Welded to Liner in Large Chemical Kettle

A 7,000-gal chemical kettle will have its jacket welded to the liner wall by means of protruding dimples. The processing vessel for high-pressure manufacture of synthetic resins is being built by The Pfaudler Co., Rochester, N. Y. The dimpling technique, said to strengthen the alloy liner, will involve about 1,272 ft of welding. The mammoth kettle will have 2,817 dimples, each 3-in. in diameter, punched out of its stainless steel jacket. The dimpled construction has been approved for ASME code stamping.

G-E Announces Electrode Comparator Slide Rule

DISTRIBUTORS of General Electric welding equipment have available a new 9-in. slide rule to compare welding electrodes. The rule is designated "GEN-37B."

* * *

Spanish Translation of Stoody Guidebook

PUBLICATION of a Spanish translation of its guidebook on hardfacing alloys was recently announced by Stoody Co., Whittier, Calif. The original English version has gone through a number of printings and has been distributed throughout the world.

Duplicating the material covered by the original text, the book describes uses of hardfacing alloys in maintenance of heavy equipment.

Good Year Ahead!

AMERICAN manufacturers are now planning to spend almost as much (within 8%) for new industrial plants and equipment in 1954 as they spent in this all-time record breaking year of 1953. The McGraw-Hill Department of Economics established this fact by making a survey of a substantial cross-section of United States manufacturing industry.

In view of the tremendous postwar surge of plant investment, many will find it hard to believe that there are plans to carry through still another year at a high level of investment. But a fact is a fact.

As go capital expenditures, so goes prosperity. There has never been a period when capital expenditures were high that was not also a period of general prosperity. So look forward to another good year!

NEWS

from page 5

OCTOBER was a month for shows. In addition to the big Metal Show (described on page 45), two distributors—J. M. Tull Metal & Supply Co. (left photo) and Robinson Welding Supply Co. (right photo)—held their own clinics

Atlanta Welding Clinic Sets Attendance Mark

INDUSTRIALISTS from all parts of the South swelled attendance to the highest on record at the third annual welding clinic and metal show staged Oct. 7-9 by J. M. Tull Metal & Supply Co., Atlanta. There was a visitor from London, England, and two from Canada. The show served to open the new steel warehouse addition of the Tull concern. The large area encompassed 33 booths with 42 exhibits.

John M. Nation, vice-president of Tull, was in charge of the show in which were exhibited and demonstrated the latest welding techniques and equipment.

* * *

Essex of Newark Expands Loading Facilities

A $15,000 remodeling program has resulted in enlarged dock facilities for Essex Welding Equipment Co., Inc., Newark. Four large highway trucks can now be loaded at one time under cover. The cylinder dock was also enlarged.

* * *

Aluminum Used in Shipbuilding

ALUMINUM has become established as a shipbuilding material, it was pointed out in a paper presented at the annual meeting of The Society of Naval Architects and Marine Engineers, held last month in New York City. "Practical Problems Relative to the Use of Aluminum Alloys in Ship Construction," by C. V. Boykin, chief staff supervisor, Steel Hull Division, and M. L. Sellers, Hull Design Division of the Newport News Shipbuilding and Dry Dock Co., discussed the practical aspects of shipyard practice in handling aluminum (including welding). The paper particularly referred to the thicker structural aluminum that would be used in the superstructures of large vessels.

* * *

Restrictions Lifted on Columbium-Tantalum

THE last remaining NPA-BDSA restriction on the use of columbium and columbium-tantalum in civilian production has been removed. Officials said control is no longer necessary because the supply substantially exceeds the demand, and military requirements have been reduced. They further stated that adequate safeguards have been made to assure availability of required amounts for the national stockpile.

The two elements are used for stabilizing stainless steels.

* * *

Lincoln Publishes "WelDesign" Course

PREVIOUSLY unpublished information on its "WelDesign" system has been made available by The Lincoln Electric Co., Cleveland. The system is said to be a new approach to making better machinery at low cost through intelligent application of the arc-welding process.

The material, prepared by Lincoln engineers, consists of a manual, self-study supplementary notes, "WelDesign" cost-calculator slide rule, moment of inertia rule, set of weld standards on onion-skin paper for duplication and a copy of the 1,300-page "Procedure Handbook of Arc Welding Design and Practice." The set costs $10 in the United States, $12 elsewhere.

Robinson Fall Clinic Attracts 330 Persons

THE Robinson Welding Supply Co.'s annual fall clinic, held Oct. 8, attracted 330 persons from about 130 companies. The Detroit firm reported it had visitors from many parts of Michigan. Half of the warehouse was used to house exhibits, and the main office was used for the showing of two moving pictures.

Among the exhibitors were The Champion Rivet Co., Linde Air Products Co., Jackson Products, Alloy Rods Co., Atlas Welding Accessories Co., Stoody Co., Worthington Corp., The Lincoln Electric Co., Vacu-Blast Co. and Westinghouse Electric Corp. All exhibiting companies had a complete line of welding products.

* * *

Comparison Seminar Conducted by Eutectic

ADHESIVES vs. solders and brazing alloys was the topic of a comparison seminar recently conducted by the training institute of Eutectic Welding Alloys Corp., Flushing, N. Y. Specialists on each phase of joining briefly explained the theory and then threw the meeting open to discussion before adjourning to the laboratory for practical demonstrations.

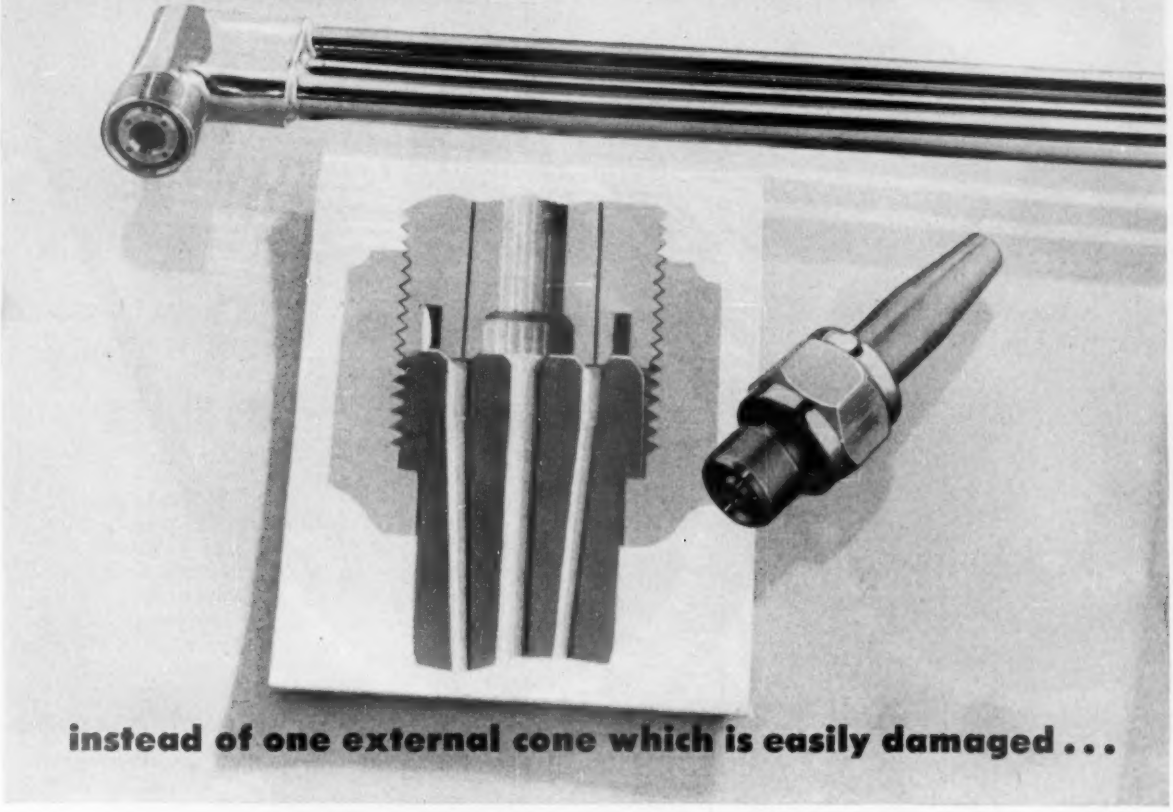
* * *

Oxygen Capacity at Ford Boosted by New Generator

INSTALLATION of a new Air Products, Inc., oxygen generator in the Ford Motor Co.'s River Rouge steel plant has increased the latter's oxygen-producing capacity to 30,000,000 cu ft a month. Air Products has four generators on lease to Ford.

(More News on page 87)

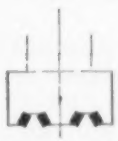
3 internal cone seating surfaces



instead of one external cone which is easily damaged . . .

internal conical seat surfaces do it . . .

external cone — easily damaged



internal cones — well protected

Internally opposing conical seat surfaces are protected against external damage and they permit complete reconditioning by swaging—a process which, on other type tips, might close up all ports. Conical surfaces on the inside—as against outside seating surfaces make all the difference—to tip life—and to your pocketbook.

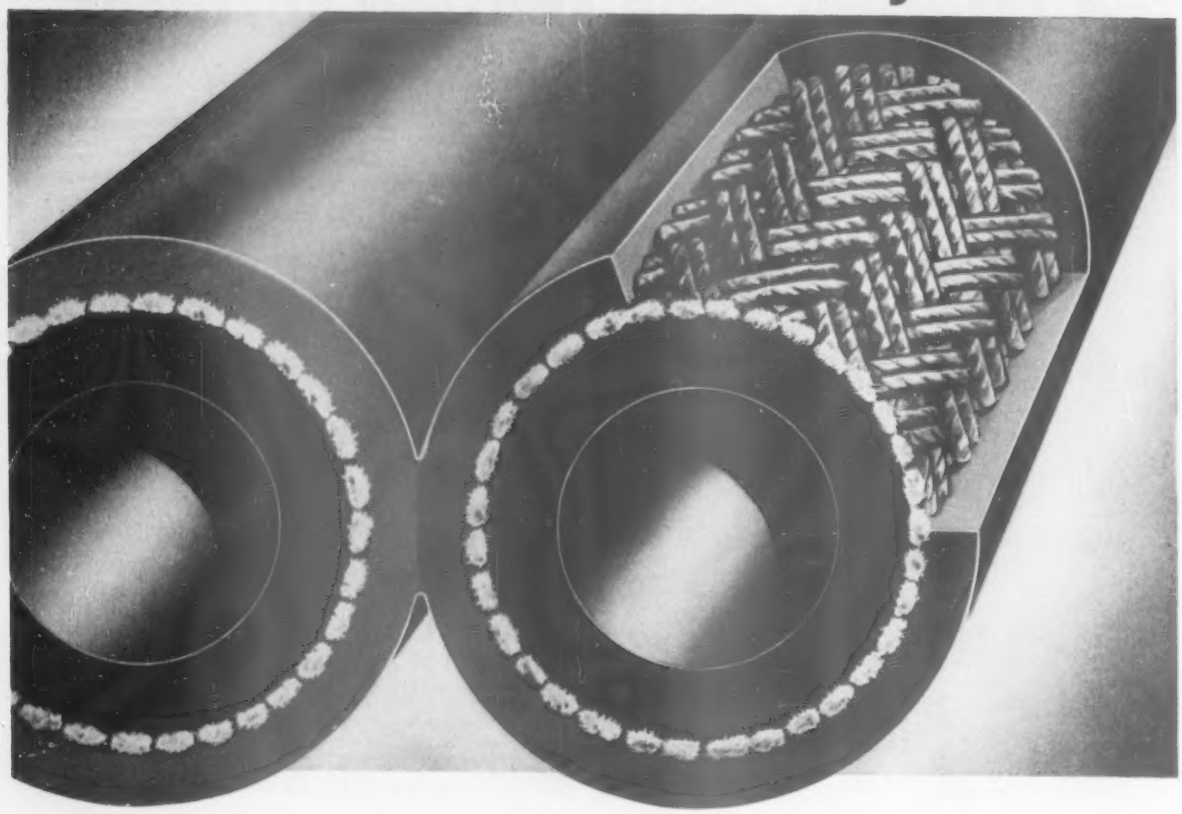
And—the most modern tip drilling processes assure each and every gas passage absolute uniformity, freedom from distortion and accurate line-up. AFTER ALL, CUTTING TIPS DO COST MONEY—WHY NOT BUY TORCHES AND TIPS WHICH CAN SERVE LONGER.

you won't need to throw away so many cutting tips

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California

532

TWIN-WELD . . . Now Four Ways Better



Hewitt-Robins Twin-Weld Hose Offers Values Found in No Other Welding Hose

Twin-Weld® — the original twin-line welding hose, preferred by over 7 out of 10 users — is now four ways better.

Twin-Weld is non-porous . . . it eliminates welding inefficiency, explosions and fires.

Twin-Weld has a greater ease of handling . . . eliminates tangling, assures flexibility. Twin-Weld has the important advantage of being a "straight-cure" hose; it won't snake.

Twin-Weld eliminates tangled lines. Its two lines are firmly bonded together, yet easily separated by cutting with a knife.

Twin-Weld Hose incorporates principles of construction and methods of manufacture which are exclusive with Hewitt-Robins. It is safer, longer-lasting and now has a new neoprene flame-resistant cover.

O.D.'s now conform to IAA specifications — 7/16", 17/32", 19/32" . . . I.D.'s 3/16", ¼", 5/16".

Get the facts about Hewitt-Robins Twin-Weld Hose. Write for Bulletin No. H-4a. Or contact your local Hewitt Rubber Distributor (see "Rubber Products" Classified Phone Book).

HEWITT HR ROBINS

Executive Offices, Stamford, Connecticut

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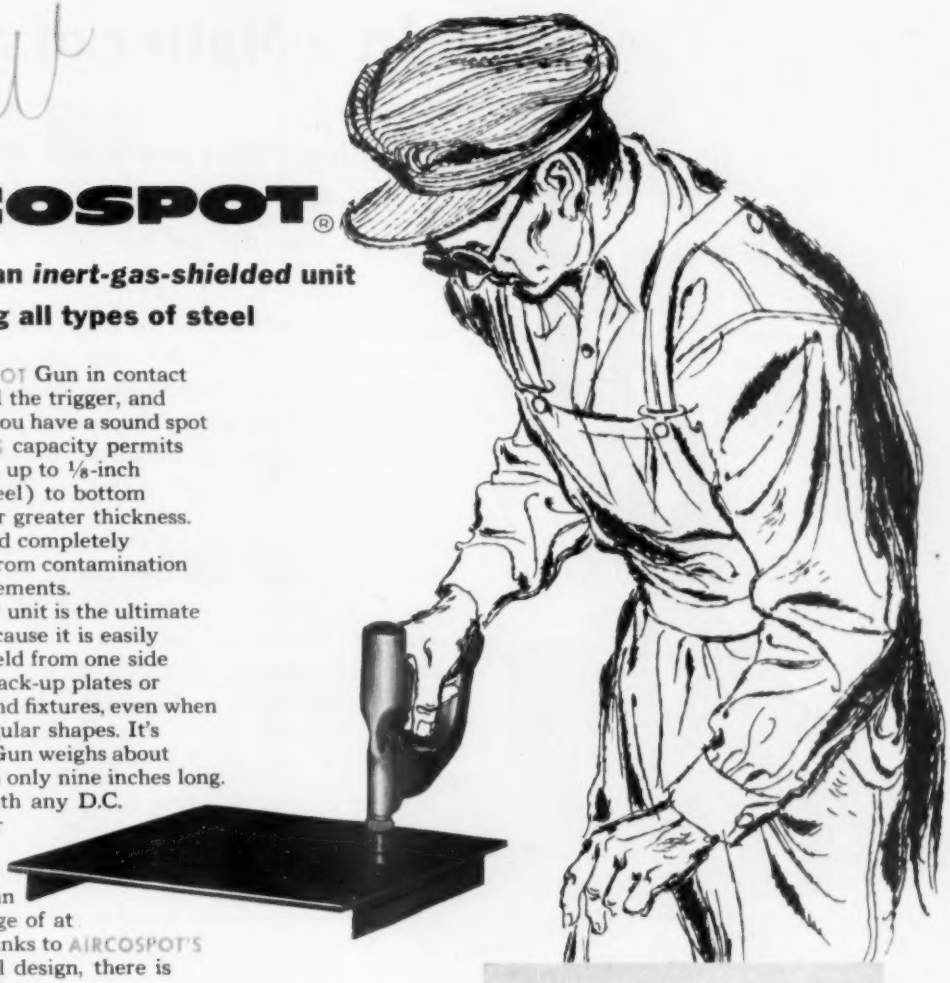
New

AIRCOSPOT®

. . . an *inert-gas-shielded* unit for spot welding all types of steel



Place the AIRCOSPOT Gun in contact with the work, pull the trigger, and in about a second you have a sound spot weld. AIRCOSPOT'S capacity permits joining thicknesses up to ⅛-inch (of any kind of steel) to bottom sections of equal or greater thickness. The inert-gas-shield completely protects the weld from contamination by atmospheric elements.

The AIRCOSPOT unit is the ultimate in convenience because it is easily portable . . . you weld from one side only . . . need no back-up plates or complicated jigs and fixtures, even when you use it on irregular shapes. It's handy, too . . . the Gun weighs about four pounds and is only nine inches long. You can use it with any D.C. motor-generator or rectifier welder which provides up to 250 amps with an open circuit voltage of at least 55 volts. Thanks to AIRCOSPOT'S electro-mechanical design, there is no need for high-frequency or electronic circuits.

The AIRCOSPOT Gun is water-cooled and uses helium or argon or a mixture of both for its inert-gas-shield. It employs a nonconsumable thoriated tungsten electrode. All connections — current, gas and water — are made through a convenient single control panel.

Write us today for prices and leaflet that provides detailed information.

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at the frontiers of progress you'll find

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CHANGE Resistance Welding Die Set-ups ... In a Matter of Seconds

Mallory "Nu-Twist*" Die Adaptors provide complete flexibility in welding operations with one die set-up

Now, you can switch from one job to another without changing dies . . . and you can do the entire job in a matter of seconds. Mallory "Nu-Twist" Die Adaptors are designed so that all the operator has to do is turn the locking nut by hand, slide out the electrode insert, slip in the one for the next job and turn the locking nut. It is simple as that . . . requires no tools.

Shops having small run resistance welding applications such as projection welding, single spot welding and electrical upsetting can effect substantial savings in set-up time and reduce die inventory. Die adaptor bases are custom designed to fit your machine specifications. Standard electrodes are available from stock. Special shapes can be designed to fit most requirements.

For complete information either write us or ask your Mallory Distributor for a copy of Technical Bulletin 8-28.

Expect more
Get more
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Electrode inserts give more flexibility... less down time.

Typical electrode for projection welding using an insulated locating pin.

Electrode insert for spot and mash welding, electrical upsetting or single projection welding.

Electrode insert for typical projection welding operation.

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario

RESISTANCE WELDING ELECTRODES, HOLDERS, DIES, RODS AND BARS, CASTINGS, FORGINGS

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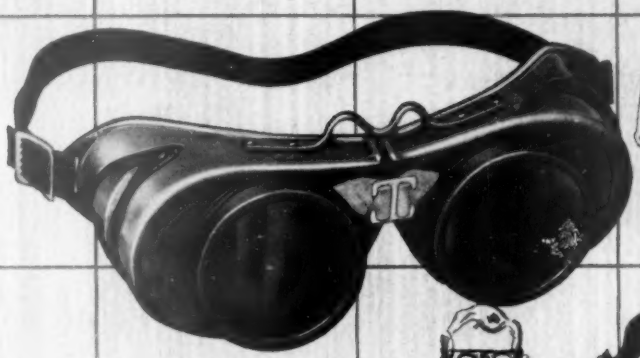
fit over the largest prescription glasses

22% larger than ordinary goggles

more ventilation through cup slots — no fogging of lenses

feather-weight aluminum rims and side shields



#500

available with or without adjusting metal top bar

contour formed to fit face snugly, comfortably

all-nylon elastic head band

uses standard 50 MM round lenses—eliminates odd size stock

#501

Here, at last, is a cover goggle that fits over modern large-frame prescription glasses and so comfortably conforms to the wearer's face that he can use them for long periods without strain or fatigue.

Ventilation has been greatly improved and area of vision increased by the new larger design, yet weight is kept at a minimum by the use of the lightest, strongest plastics.

These outstanding new Eyegard Imperial Cover Goggles use standard 50 MM round lenses thereby eliminating stocking of odd size lenses. They provide the utmost in comfort, maximum in protection, the most wanted features of any goggles on the market today. *Cost less than any other quality goggles.*

#500 WELDER'S COVER GOGGLES, with baffled side shields

#501 CHIPPER'S AND GRINDER'S COVER GOGGLES, with perforated side shields

#502 CHIPPER'S AND GRINDER'S COVER GOGGLES, clear plastic, with perforated side shields

Men who do not use prescription glasses will find the same superior quality in the following standard size Imperial Goggles:

#150 WELDER'S CUP GOGGLES' with baffled side shields

#151 CHIPPER'S AND GRINDER'S GOGGLES, with perforated side shields

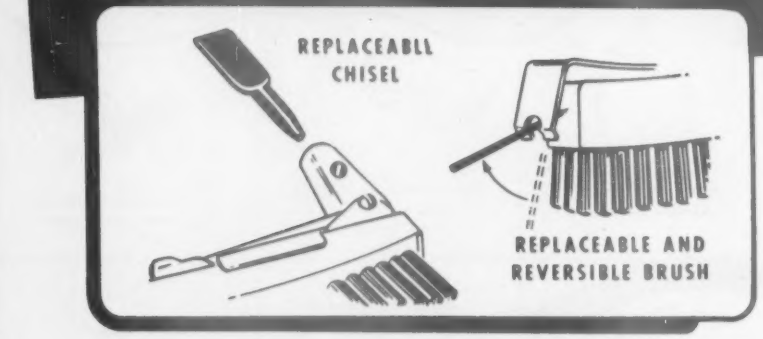
#152 CHIPPER'S AND GRINDER'S GOGGLES, clear plastic, with perforated side shield

AMERICAN INDUSTRIAL SAFETY EQUIPMENT CO.

3503 LAKESIDE AVENUE CLEVELAND 14, OHIO

DIVISION OF THE BURDETT OXYGEN COMPANY OF CLEVELAND

THE MOST PRACTICAL WELD CLEANING TOOL EVER DESIGNED!

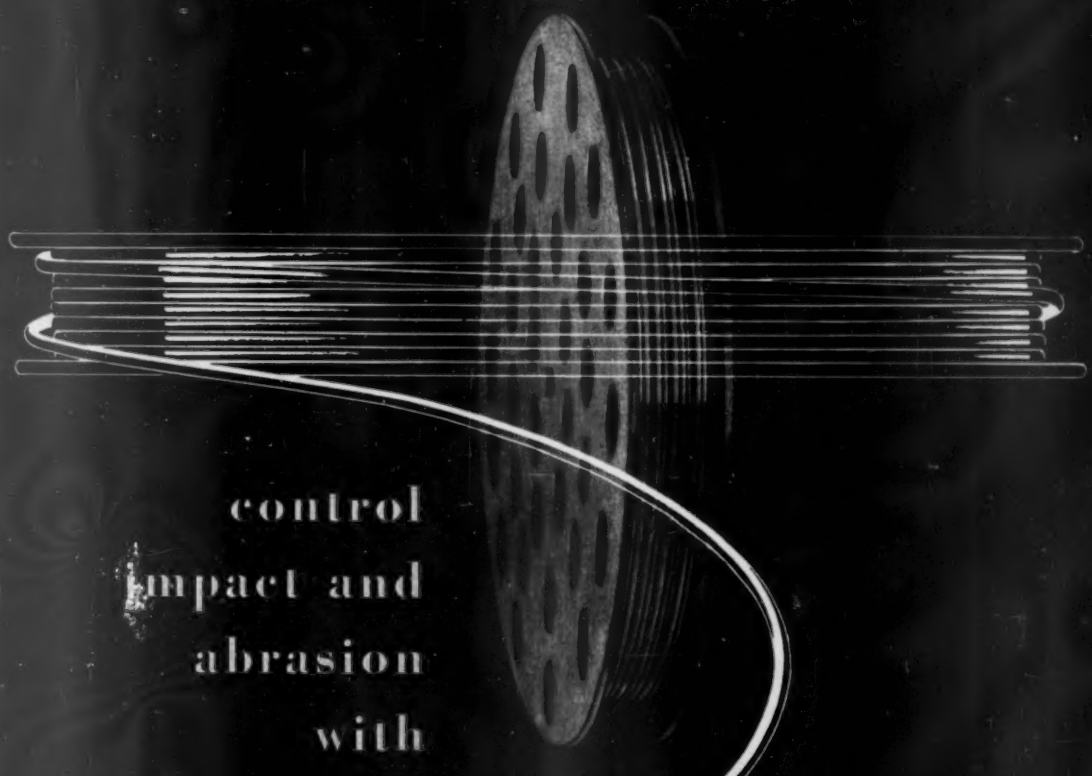


Model B-1
(With wood handle, B-1W)

Atlas "RE-BIT DUAL TOOL"

● Experience real economy with this tool that requires replacement of worn parts only! The "Re-bit" chisel can be set at any angle, has a wider edge and narrower cross section, gets into corners and pockets better, affords better vision. "Re-bit" is easier to sharpen, lasts longer . . . Ask your welding supply dealer for information on all 27 Atlas models.

Atlas WELDING ACCESSORIES CO.
707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICH.



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FOR AUTOMATIC HARDFACING

A new chrome-moly electrode for submerged arc welding equipment

Excellent for rebuilding and hardfacing tractor rollers and idlers, back-up rolls, crusher rolls, steel wheels, sheeting rolls, as well as dozens of other applications. For complete metallurgical information and technical data, write Amsco, Chicago Heights, Illinois.

AMERICAN Brake Shoe COMPANY

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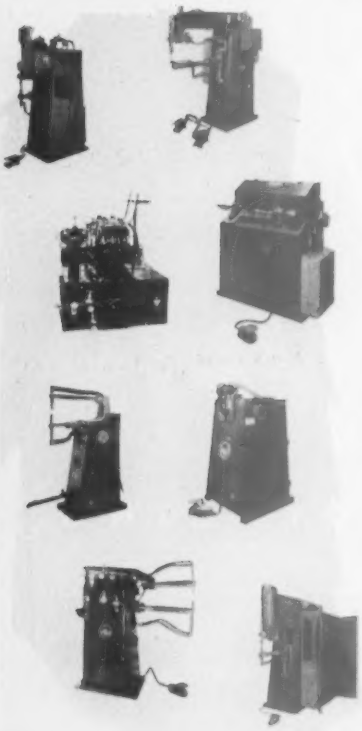
OTHER PLANTS: NEW CASTLE, DEL.; DENVER; OAKLAND, CAL.; LOS ANGELES; ST. LOUIS; IN CANADA: JOLIETTE STEEL DIVISION, JOLIETTE, QUE. AMSCO WELDING PRODUCTS DISTRIBUTED IN CANADA BY CANADIAN LIQUID AIR CO., LTD.

AMES CUTS AND INCREASES

TYPICAL AMES SPOT WELDERS



IF YOU HEARD PEOPLE YOU KNOW SAY — THE AMES SPOT WELDER COMPANY . . .

. . . helped increase their volume of production

. . . lowered operating costs

. . . which doubled their profits over old methods

Wouldn't you feel that in all fairness to yourself and to your future, that you should at least give the Ames Company an opportunity to prove the same for you?

We are constantly engaged in product applications. This includes not only welding and processing techniques, but cooperation with customers in the solution of everyday welding problems.

So, if you have a welding problem consult with us. Our engineers will be glad to cooperate all the way. They may have an operational suggestion, or select for you an analysis or processing that will save you money.

This is part of our business. It will cost you nothing and will certainly repay you well.

IF YOU MAKE ANY WELDED PRODUCT —

Use AMES ENGINEER

WELDING COSTS

YOUR PROFITS

bringing to your service

- **30 YEARS KNOWHOW**
- **A STAFF OF SPECIALISTS**
- **A HALF MILLION DOLLAR PLANT**

at no cost to you

ATTENTION
MANUFACTURERS
WROUGHT IRON
TUBULAR AND
WIRE PRODUCTS
LOW COST
PATENTED METHOD
OF
WELDING
Eliminates costly brazing, arc welding and bolted joints.
NO CHIPPING
NO CLEAN UP
NO TOUCH UP
PUBLICLY ACCLAIMED BY TOP INDUSTRIES

SINCE 1923
Ames Welder

ASK US — WE HAVE THE ANSWERS FOR RESISTANCE WELDING

PROJECTION WELDING
MULTIPLE WELDING
PULSATION WELDING
BUTT WELDING
STITCH WELDING
SEAM WELDING
CROSS WIRE WELDING
WROUGHT IRON
CHROME TUBE
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SPECIAL PURPOSE WELDERS
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ING SERVICE

Ames Spot Welder Co., Inc.
1328 58th St., Brooklyn, N. Y.

Have Local Rep. Call ☐

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Please send without obligation on our part, what you have to offer. We want facts on (circle numbers desired).

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Company name .....

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9349* MEN OF WELDING

*AMERICAN WELDING SOCIETY MEMBERSHIP SEPTEMBER 1, 1953 1412 NEW MEMBERS GAINED IN 1 YEAR

support A.W.S. activities

Since 1919, the American Welding Society has exerted a constant influence for the betterment of welding processes through research and exchanges of experience within its membership. Many of the 9349 men in A.W.S. are leaders in their respective industries today because of training and encouragement they have received from other "Men of Welding" in the Society.

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There are 66 active local sections of A.W.S. covering almost every part of the United States. They hold monthly technical meetings and plant visitations. They bring together the best welding minds of the nation and present accurate information on Welding design, fabrication and maintenance. You will profit from A.W.S. membership.

AMERICAN WELDING SOCIETY
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Please send me more information on advantages of membership in the American Welding Society

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Your choice for strong, leakproof piping!

This TUBE-TURN Concentric Reducer is designed with the smoothest reductions and the strongest knuckle contours consistent with adequate tangent lengths and the end-to-end dimensions established for this type fitting by the American Standard. TUBE-TURN Reducers are superior to the pipe in bursting strength and their fatigue life equals that of the butt weld used to join them to the pipe.

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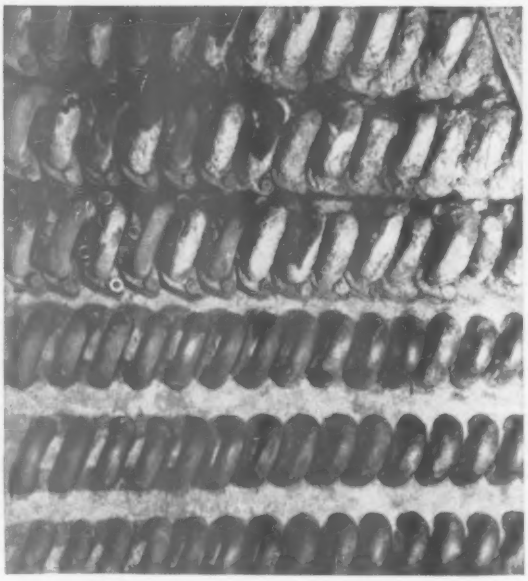
TUBE TURNS' *Engineering Service*

shows the way to eliminate equipment shutdowns

● In the past, directional changes in the tubes used in fuel economizers for boilers have been made with flanged U-bends or with header boxes. Although leakage was inevitable sooner or later, and repairs difficult, such conventional connections were necessary to permit periodic dismantling and mechanical cleaning.

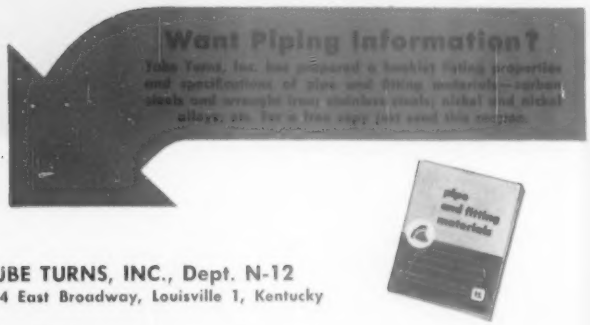
Now, improved methods of water treatment have eliminated the need for such cleaning in most cases, and with it, the need for joints that can be readily disassembled. Accordingly, TUBE TURNS' Engineering Service has recommended re-fabricating tube assemblies with TUBE-TURN 180° Welding Returns, which are available in thicknesses and radii to match the tube walls and centers of most economizers.

The result has been the elimination of any leakage in economizer tubing, thus ending shutdowns of economizers, boilers, and other critical equipment. In addition, pressure drop is reduced, and flow conditions improved. When you have a tough piping problem, bring it to TUBE TURNS' Engineering Service—a service that typifies TUBE TURNS' leadership in piping engineering.



At top: flanged connections in economizer. *At bottom:* permanently leakproof, TUBE-TURN Welding Returns.

Shop fabrication of welded piping assemblies is easy, thanks to the uniform wall thickness and dimensional accuracy of TUBE-TURN Welding Fittings. Line-up is fast and accurate.



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MODEL 440

Introducing PENOPTIC *Protective* FACE SHIELDS

The high quality and performance of Pennsylvania Optical products throughout 67 years of ophthalmic development have been incorporated in these new face shields. The clear or green, metal-bound, acetate windows are non-pitting, flame-resistant. (Bronze fine wire mesh windows are also available.) Each model permits free passage of air about the head . . . can be worn over goggles or prescription eye glasses. Now, Penoptic's manufacturer-to-you distribution policy again offers new opportunities to save with safety.

MODEL 438

MODEL 411

MODEL 412

MODEL 425

CONSTRUCTION FEATURES

- Windows of finest optical acetate provide that extra measure of safety.
- Snap-tight fasteners permit speedy, secure attachment of windows to headgear units.
- Formed fibre crown protectors extend coverage over brow; support windows firmly.
- Disposable sweatbands of absorbent, anti-septically treated paper for new maintenance economy and improved industrial hygiene.
- Fibre headbands treated for moisture-resistance, tough, easy to clean, easy to adjust.
- Plastic sleeves cover adjustable headbands for added smoothness and comfort of fit.
- Adjustable spring tension assembly permits easy lifting of window to raised "off" position; holds securely in lowered "safe" position.

For Prices And Full Information On Complete Line Of Face Shields Write Directly To:

Order Direct and Save!

PENNSYLVANIA OPTICAL COMPANY

READING, PENNSYLVANIA

Known For Fine Ophthalmic Products Since 1886

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FOR EVERY INERT GAS WELDING JOB

As every welder knows, you can't use the same electrode on every job. For best performance and longest electrode life, you must select the right rod for every particular purpose.

This is why Sylvania offers 3 *different* tungsten electrodes to meet the full range of requirements of any inert gas arc welding work.

Sylvania . . . a pioneer in tungsten

Sylvania is a pioneer in the development of tungsten in many forms. As a result, our engineers and metallurgists have provided the precise type of tungsten rod for every need. Sylvania's research and advanced techniques in manufacture and quality control . . . from ore to finished product . . . assure minute-saving operation and dollar-saving dependability.

Either Sylvania Puretung, Thoriated Tungsten or Zirtung Electrodes will answer any inert gas welding problem you have. So, order the types you require from your nearest Sylvania Welding Distributor today, or write to: Sylvania Electric Products Inc., Dept. 3T-4312, 1740 Broadway, New York 19, N. Y.

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Viking

THE WELDERS WITH GREATER ARC STABILITY !

- ✶ INERT-ARC
- ✶ AC METAL-ARC
- ✶ DC RECTIFIER
- ✶ RAD-ARC-TROL

INERT-ARC WELDER—Combines instant starting, smooth and stable arc, compactness, and portability.

AC METAL-ARC WELDER—Patented design features high duty cycles without cooling fans, minimum "no-load" loss, smooth and stable arc. Available in models from 130 to 600 amp capacity.

DIRECT CURRENT SELENIUM RECTIFIER WELDERS—The latest development in direct current welding equipment. No moving parts—low maintenance.

Viking—the name synonymous with welding know-how—gives you a PRODUCTION ENGINEERED welder line for all your needs.

Viking welders—famous for their smooth, STABLE arc—are tops in performance under all conditions. Carefully designed—ruggedly built—rigidly inspected, Viking welders do the job economically and effectively.

Viking engineers and distributors are well qualified to assist you in determining the right equipment for your jobs—or in converting your present equipment to high-frequency or inert-arc welders.

RAD-ARC-TROL—An automatic high-frequency arc starter and stabilizer for use on ANY MAKE of AC or DC welder. Model MR is used for light gauge metallic-arc welding. Model MRG converts your present welder to the Inert-arc Process. The gas regulating attachment is included in the unit.

WRITE FOR COMPLETE INFORMATION ON ALL VIKING WELDERS

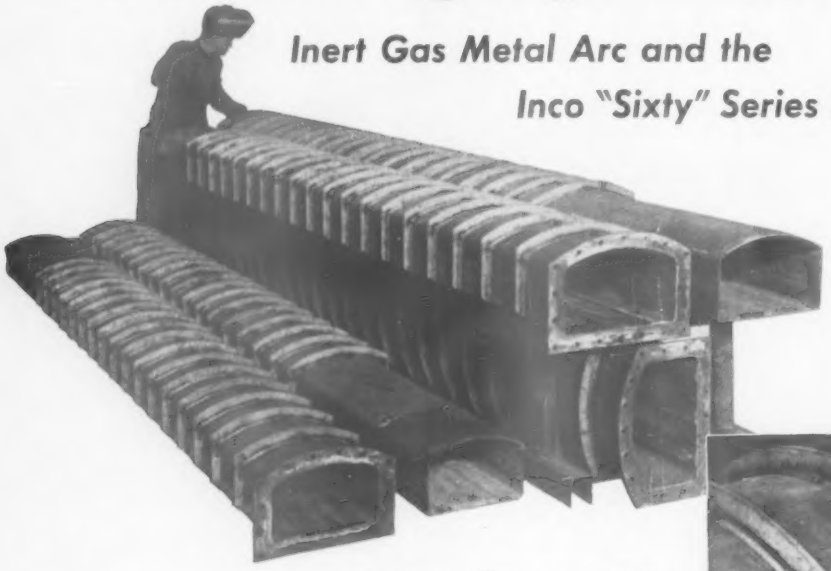
Viking

DIVISION OF
PROGRESSIVE WELDER SALES CO.

3060 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

Here's a hard-to-beat combination ...for welding high nickel alloys

Inert Gas Metal Arc and the Inco "Sixty" Series Filler Wires



These Inconel muffles are being welded for use in high temperature heat-treating furnaces. The welders used the inert gas metal-arc (consumable electrode) method to save time and eliminate slag removal.

Close-up of a muffle showing welded construction. Note: Longitudinal weld on side is at midpoint instead of at corner to eliminate internal stresses.

Take a tip from the boys who work on the tough jobs. They say there's nothing in the shop like the inert gas metal-arc process for getting high quality welds fast.

And it's easy to see why:

- **No flux**
- **No slag removal**
- **Heavy sections can be welded without pre-heat**
- **The arc and puddle are clearly visible during welding**

Also, the controlled composition of the "Sixty" series of filler wires, developed by Inco, insures sound, ductile welds.

Disposable spools of this series filler wire are available for any of the consumable electrode processes. The spools are supplied in wire diameters of .035, .045, and .062 inches.

Cut lengths 36 inches long for use with the Tungsten arc process are produced in sizes from 1/16-inches to 3/16-inch diameter.

Here's what you should specify for welding the high nickel alloys:

Monel® – "60" Monel Rod or Filler Wire
Nickel—"61" Nickel Rod or Filler Wire
Inconel® – "62" Inconel Rod or Filler Wire
"K"® Monel – "64" "K" Monel Rod or Filler Wire
Inconel "X"®—"69" Inconel "X" Rod or Filler Wire

For more detailed information on welding Inco Nickel Alloys, write for a copy of Technical Bulletin T-2, "Fusion Welding of Nickel and High Nickel Alloys."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Inco Nickel Alloys

INCO

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL • "S"® MONEL
INCONEL® • INCONEL "X"® • INCONEL "W"® • INCOLOY®
NIMONIC® Alloys • NICKEL • LOW CARBON NICKEL • DURANICKEL®

Vibration can play havoc with a radiator – but not with this one engineered by Yates-American for Manitowoc to cool the engines of their giant cranes.

End castings are made of cast iron with the copper tube header plates brazed to the castings with Silvaloy 35. No amount of vibration can disturb these bonds, the joints are as strong as the metals joined.

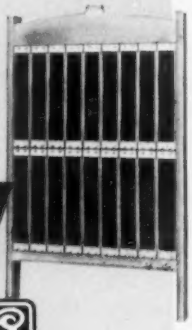
Low Temperature Silvaloy Brazing is helping to speed and simplify brazing production, lower costs and improve results for manufacturers in many fields. Call the Silvaloy Distributor in your area for complete information—or ask him for technical assistance. A Silvaloy Technical Expert will be sent to your plant at once, without cost or obligation to you. ★ ★ ★

Successful Brazing

ON YATES-AMERICAN RADIATORS

with... SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY



YA

Radiator built by Yates-American Machine Company, Beloit, Wisconsin, for Manitowoc Engineering Company, Manitowoc, Wisconsin.

Manitowoc SPEED CRANE

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APW

PYLE NATIONAL INCREASES PRODUCTION 47%!

Soldering Of Spring Assemblies Speeded By *LINDBERG* Induction Heating Unit

An hourly production increase of 47% . . and a per-operator production increase of 330% through the use of a Lindberg Induction Heating Unit! These are the money saving facts and figures reported by Pyle National Co., Chicago manufacturer of electrical components.

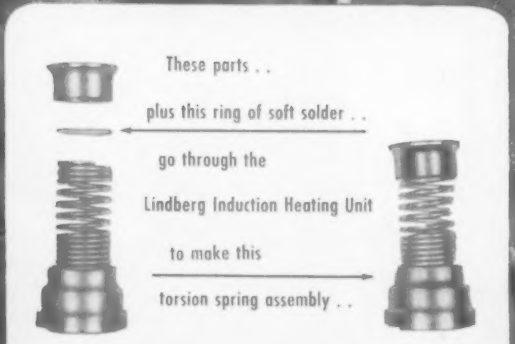
The company uses a 10 KW Lindberg unit for the production soldering of flanges to coil springs in the manufacture of torsion spring assemblies. The time cycle is 11 seconds for each assembly.

Production has been increased to 125 assemblies an hour . . with one girl operating the equipment. This is an hourly increase of 40 assemblies over the former method where soldering was done by a team of three men using gas torches. And the hourly per-operator production is up from 28 to 125!

With the induction heating unit, there are no open flames from gas torches. No extra exhaust fans are required . . there is little danger of burns to operators . . fire hazards are virtually eliminated!

And there is a substantial economy of floor space! Formerly the three torch operators required more than 60 square feet of floor space . . but the Lindberg Induction Heating Unit requires less than 30 square feet.

If your requirements call for production soldering, brazing, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.


These parts . .
plus this ring of soft solder . .
go through the
Lindberg Induction Heating Unit
to make this
torsion spring assembly . .

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HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY,
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A product for EVERY PORTABLE GRINDING job

● *Your Widest Choice of Abrasives for Every Operation*

PRODUCTS	SNAGGING or ROUGH GRINDING	DEBURRING	WELD GRINDING	SMOOTHING EDGES	FINISHING and POLISHING	DIE GRINDING
Straight Wheels	✓		✓		✓	✓
Rubber Bushed Straight Wheels	✓		✓			
Mounted Wheels		✓	✓	✓		✓
Cup Wheels	✓		✓			
"MX" Straight Wheels	✓	✓	✓		✓	✓
"MX" Mounted Wheels		✓		✓	✓	✓
"MX" Discs and Depressed Center Wheels	✓	✓	✓	✓	✓	
Coated Abrasive Discs		✓	✓	✓	✓	✓
Coated Abrasive Bands and Sleeves		✓		✓	✓	✓
Cartridge Rolls		✓		✓		✓
Coated Abrasive Belts with "Port-A-Belt" Grinding Attachment	✓		✓		✓	✓

Deburring with slotted discs. You can choose the deburring method best for you from at least 7 abrasive products by CARBORUNDUM.

Weld clean-up with rubber-bushed straight wheel by CARBORUNDUM... one of 8 ways you can grind welds with portable equipment.

Rough grinding with straight wheel. This job could also be done economically with abrasive belts and the Port-A-Belt grinding attachment by CARBORUNDUM.

How can you be *sure* you're getting the highest possible production at the lowest possible cost in your portable grinding operations? By asking CARBORUNDUM—your *one source* for every type of abrasive product.

CALL YOUR CARBORUNDUM DISTRIBUTOR TODAY. He offers experienced counsel, complete stocks, prompt delivery.

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the ONLY source for EVERY abrasive product you need

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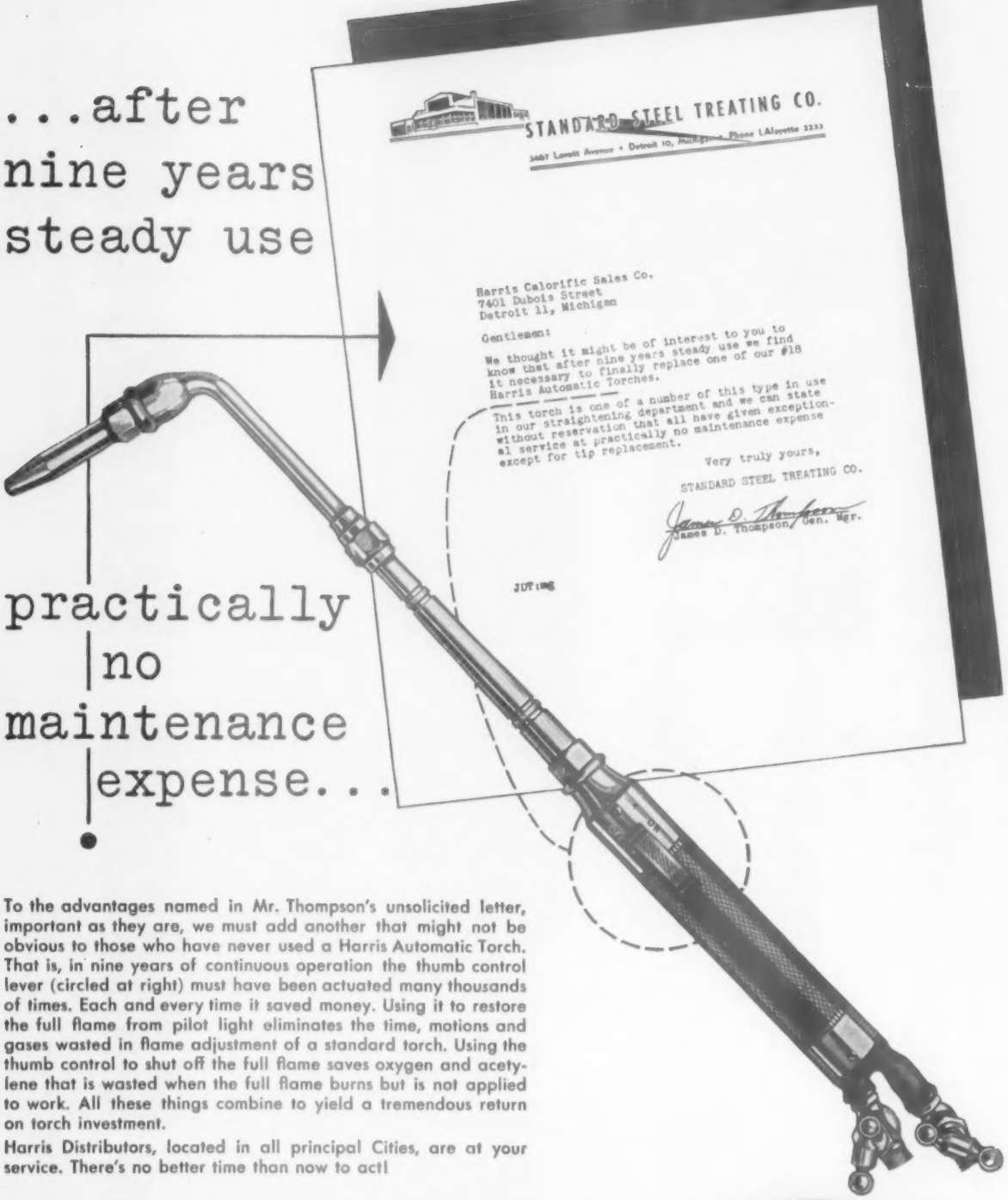
...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
3467 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 2333
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

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You don't get caught with steel you can't use!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

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- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

You can avoid this costly possibility by using the nearest U. S. Steel Supply warehouse as your own. From it, you can get the steel you need . . . in large or small quantities . . . cut to your specifications . . . delivered to your production area . . . at the time you desire. You run no risk of inventory obsolescence. Your U. S. Steel Supply salesman will help you put your steel purchasing on a most economical and efficient basis.

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UNITED STATES STEEL

New RA Welder means greater welding performance

Rectifier welder pioneered by Westinghouse now provides many added advantages

Here is the *all-new* RA Welder, truly the finest, fastest and easiest, *any* position, d-c welding machine on the market. Westinghouse, the pioneer in rectifier type d-c welding equipment, has incorporated in the new welder all the engineering know-how and years of "on-the-job" welding performance needed to make the "RA" a *proved performer*. The exclusive features alone —Arc-Drive Control, Built-in Automatic Overload Protection, Single-Range Stepless Current Control— set new quality and performance standards for the welding industry.

Take the Arc-Drive Control for example: This exclusive Westinghouse feature provides an extra "push" to the metal as it leaves the electrode and moves toward the welding surface. This extra "push" assures greater weld penetration. In addition, the Arc-Drive Control enables the operator to quickly and easily adjust the arc-drive current to fit the needs of the particular job.

Another feature is the new "on-off" switch—the AB De-ion® Circuit Breaker. This circuit breaker provides positive and automatic protection against excessive overheating, yet permits harmless temporary overloads without interrupting production.

A rugged frame and a *Bonderized* sheet-steel case enclosure provide maximum protection for both indoor and outdoor operation.

Superior ventilation combines the use of natural air flow and a fan powered by a dependable, nonreversible, totally-enclosed, 1/8-hp motor with prelubricated ball bearings. Specially designed air ducts within the unit provide for free and dependable passage of cooling air—this means longer life.

Features like these—the result of years of experience in producing rectifier welders—put the Westinghouse RA Welder ahead of other types of d-c welding equipment. Get all the reasons why the Westinghouse RA Welder is the best buy. Ask your Westinghouse representative for full details, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

COUNT ON THESE DEFINITE ADVANTAGES

- **ARC-DRIVE CONTROL** provides for greater weld penetration.
- **SINGLE-RANGE STEPLESS CURRENT CONTROL** allows infinite number of current settings with single-dial adjustment.
- **CIRCUIT BREAKER "ON-OFF" SWITCH** provides positive and automatic thermal overload protection.
- **SUPERIOR VENTILATION** affords greater natural cooling . . . longer winding life.
- **WEATHERIZED CONSTRUCTION** offers maximum indoor and outdoor weather protection against snow, rain, water and the most rugged of operating conditions.
- **QUIET OPERATION** means less operator fatigue and provides longer machine life through elimination of moving parts.

J-21835

YOU CAN BE SURE...IF IT'S Westinghouse

NOW A WESTERN ELECTRODE PLANT TO SERVE OUR WESTERN CUSTOMERS

WESTERN headquarters for:

ARCALOY stainless steel electrodes

BRONZE-ARC phosphor bronze electrodes

NICKEL-ARC electrodes for cast iron

TOOL-ARC electrodes for tools and dies

WEAR-ARC hard-facing electrodes

WELD-ARC low hydrogen electrodes

NOW IN PRODUCTION ... the Pacific Coast Division manufacturing plant of the Alloy Rods Company ... world's leading manufacturer of alloy arc welding electrodes ... at 750 Lairport Street, El Segundo, California. Today all industries in the eleven Western States can secure the finest quality electrodes and rapid delivery on all six internationally-recognized brands of the finest electrodes made—anywhere. *Write, telephone, or wire for prompt shipment.*

AR-21

HERMETICALLY SEALED • Package protection via 5 and 10 lb. hermetically sealed all-metal containers . . . every electrode "oven fresh" from factory to point of use!

ALLOY RODS COMPANY

NO FINER ELECTRODES MADE . . . ANYWHERE

•

General Offices & Plant
YORK • PENNSYLVANIA

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EL SEGUNDO • CALIFORNIA

IN CANADA • Distributed by Canadian LIQUID AIR Company, Limited—Branches, Plants, Warehouses and Dealers Coast to Coast

Alloy Rods Co.

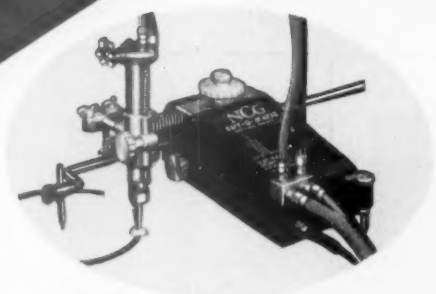
TRY NCG'S
CUT-O-MATIC®
IN YOUR OWN SHOP

without cost or obligation

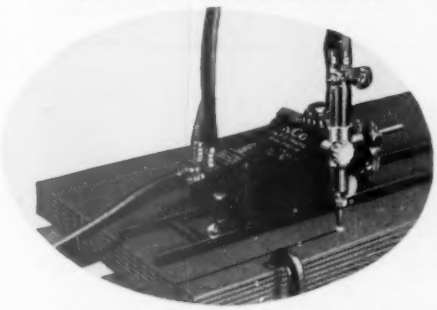
Portable low-cost flame cutting machine does better, faster work at lower cost and less handling!

Yes, you can try Cut-O-Matic, the portable low-cost flame cutting machine, in your own shop, on your work, without cost or obligation. See how it turns out quality work, in bigger quantities, with little or no machining, less work handling and a big cut in costs.

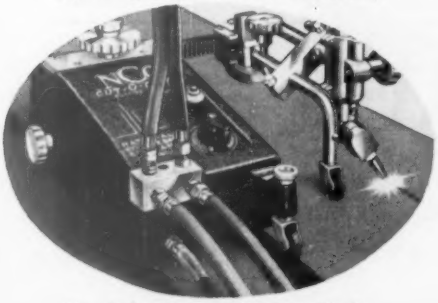
Cut-O-Matic weighs only 50 lbs. It is taken to the work, used wherever power is available. Motor-driven and track-guided, its operation requires no special skill. Its flame slices through steel leaving a clean sharp edge and surface. It cuts steel plates, stacked sheets and heavy slabs. It cuts on the square or bevel, it cuts straights, circles, strips, and rings.



Cutting Circles and Arcs from 3 to 60". Rings can be cut with two-torch mounting.



Stack Cutting. Cutting sheets clamped together gives real production economy.



New "Floating Torch" automatically cuts accurate bevels on steel plate.

NOW! NEW FLOATING TORCH ASSEMBLY ASSURES PERFECT BEVEL CUTS ON CURVED OR WAVY PLATES

To bevel accurately plates with wavy or bulging surfaces, NCG now offers its new Floating Torch Assembly that automatically results in perfect bevels (see illustration at left). Contour wheel raises or lowers new swivel-head beveling torch to compensate for unevenness of plate surface, holding torch tip at same angle and distance from plate. Permits new *ease* and *economy* in plate preparation.

As the first step toward more profitable metal working, have versatile, useful Cut-O-Matic and the new Floating Torch Assembly demonstrated in your own shop. Contact your nearest NCG district office or authorized NCG dealer. No charge or obligation. Illustrated Booklet N-134 is yours on request. Write today.

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840 N. Michigan Avenue, Chicago 11, Illinois

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EVERYTHING FOR WELDING

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WHETHER A.C. or D.C. there's a miller WELDER... for every need

- A.C. ARC WELDERS
- PORTABLE SPOT WELDERS
- HELIARC WELDERS
- WELDER AND POWER PLANT COMBINATIONS
- SR D.C. WELDERS

MILLER, the pioneer in electric welding equipment, continues to lead the industry in quality and new developments — in A.C. arc welders . . . portable spot welders . . . inert gas ("Heliarc") welders, welder and power plant combinations, selenium rectifier type D.C. welders. Dollar for Dollar there is no better welder than MILLER whether A.C. or D.C. . . . for manual or automatic applications.

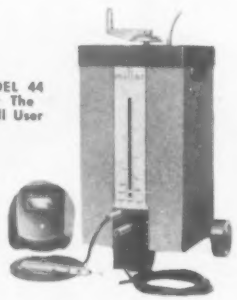
MODEL 100 Series Heavy Duty Industrial Arc Welder 7 models

New SELENIUM RECTIFIER TYPE DC Arc Welder 4 models

MODEL AEA-200L Engine driven A.C. Arc Welder and power plant . . . 3 models

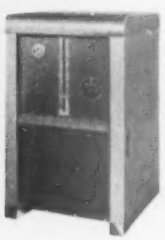
MODEL DEA-300L D.C. Engine Driven Rectifier Type Arc Welder

MODELS 61-F & 61-M General Utility Welders



MODEL 44 For The Small User

ARC WELDERS For Submerged Arc Welding 4 models



MODEL 99 A.C. 250 Amp. Arc Welder

MODEL 88 Industrial ARC WELDER

A.C. ARC WELDERS For Heliarc Welding 9 models

PORTABLE SPOT WELDERS

MODEL 10KVA-20KVA

MODEL MSW

MODEL LMSW-52

ARC - SPOT GENERATOR WELDERS

miller

ELECTRIC MANUFACTURING CO.

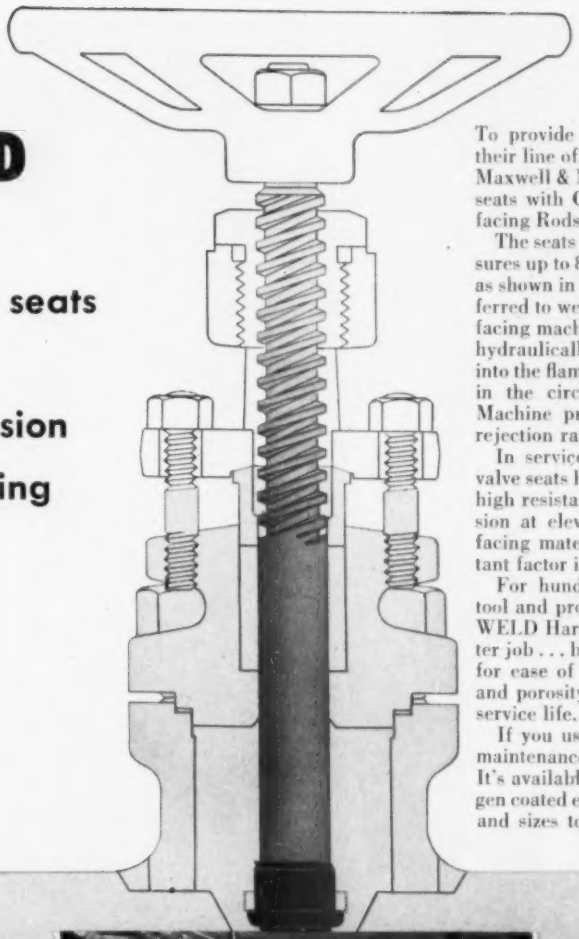
SINCE 1929 • APPLETON, WIS.

Write

Want to know full details of MILLER Welders? Write today . . . we will gladly send you complete information, or see your MILLER distributor.

REXWELD

hard-faced Hancock valve seats resist erosion, corrosion, abrasion ...are non-galling



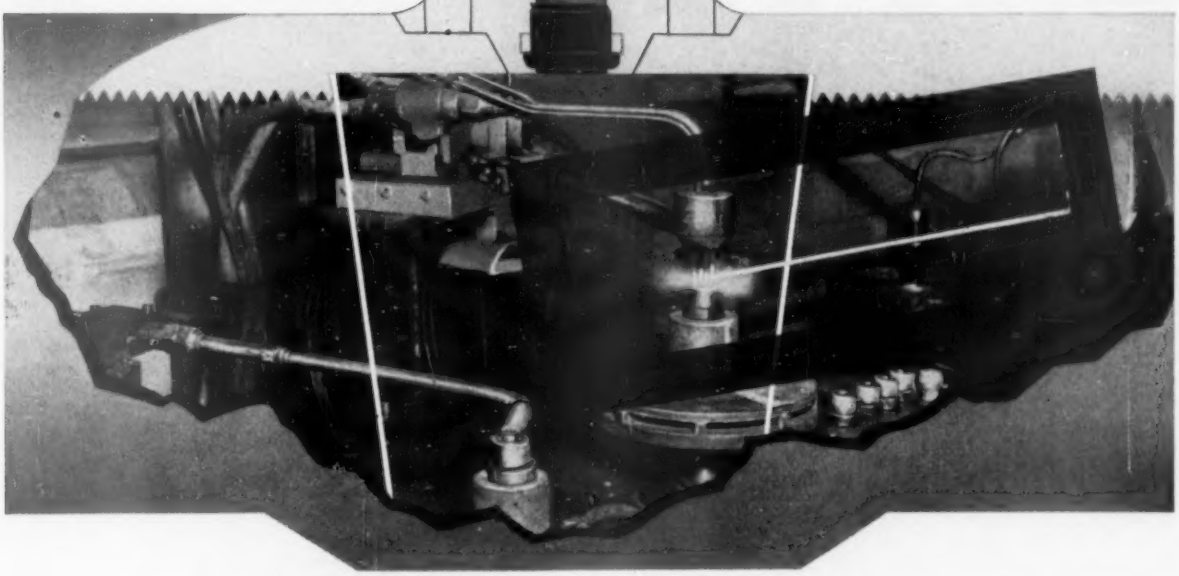
To provide long, trouble-free service life for their line of Hancock gate valves, the Manning Maxwell & Moore Company hardface the valve seats with Crucible REXWELD A Hard Surfacing Rods.

The seats for these valves, which handle pressures up to 800 psi at 750°F, are first preheated as shown in left portion of photo . . . then transferred to welding table of semi-automatic hardfacing machine. After welding head is lowered hydraulically, a rod of REXWELD A is fed into the flame and the molten metal is deposited in the circular recess in the seat surface. Machine produces 70 seats an hour, with a rejection rate of only 1%.

In service these REXWELD hard-surfaced valve seats have demonstrated an exceptionally high resistance to erosion, corrosion and abrasion at elevated temperatures, and the hardfacing material does not gall — a very important factor in good valve operation.

For hundreds of other applications where tool and product life must be increased, REXWELD Hard Surfacing Rods have done a better job . . . because they are especially designed for ease of application and to produce crack and porosity free surfaces that give maximum service life.

If you use hard surfacing in production or maintenance, be sure you order REXWELD. It's available in both bare rods and low hydrogen coated electrodes — in many different grades and sizes to meet your specific requirements.



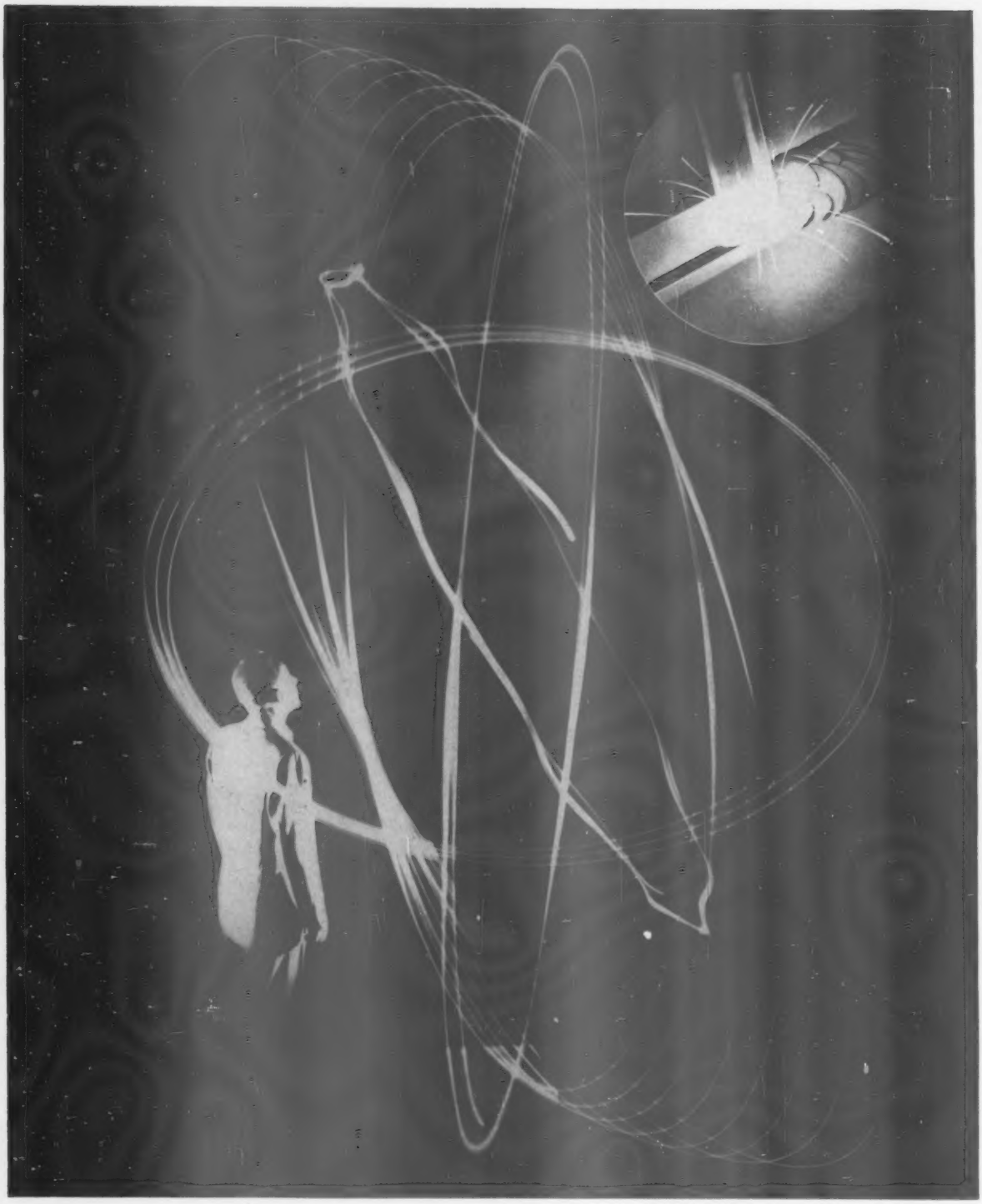
CRUCIBLE first name in special purpose steel

53 years of Fine steelmaking

REXWELD HARD SURFACING ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



FOR LOW HYDROGEN ELECTRODES

Weldrod coatings with TAM Ruflux T increase the speed with which a slag sets up while providing better slag control. Ruflux T is a compound containing approximately 91.5% ZrO and 5.4% SiO_2. Mesh size is approximately 0.1% on 325 mesh. Detailed information is easily obtained by writing our New York City Office.

*TAM and RUFLUX are registered trademarks.

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NATIONAL LEAD COMPANY

Executive and Sales Offices: 111 BROADWAY, NEW YORK CITY
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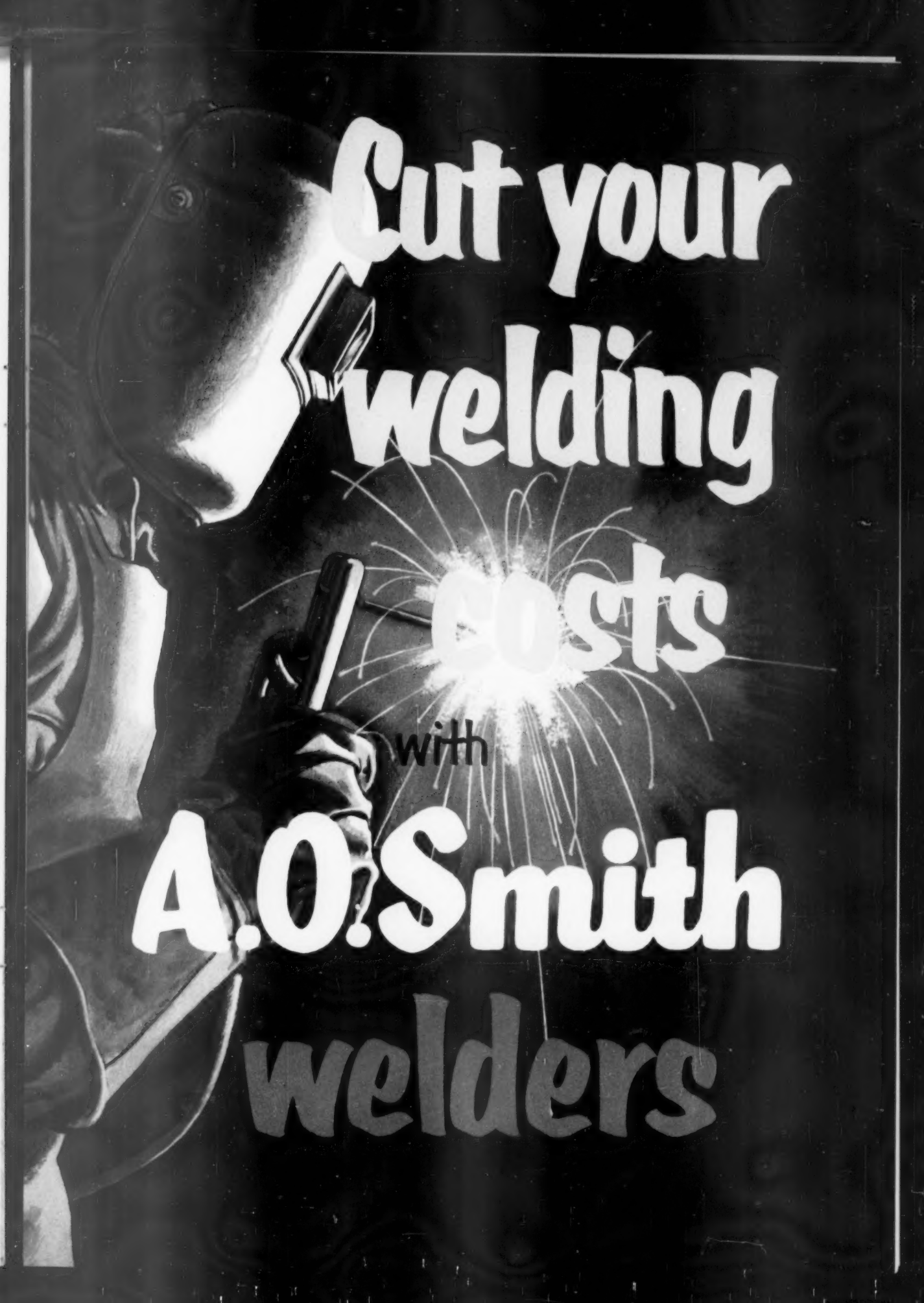
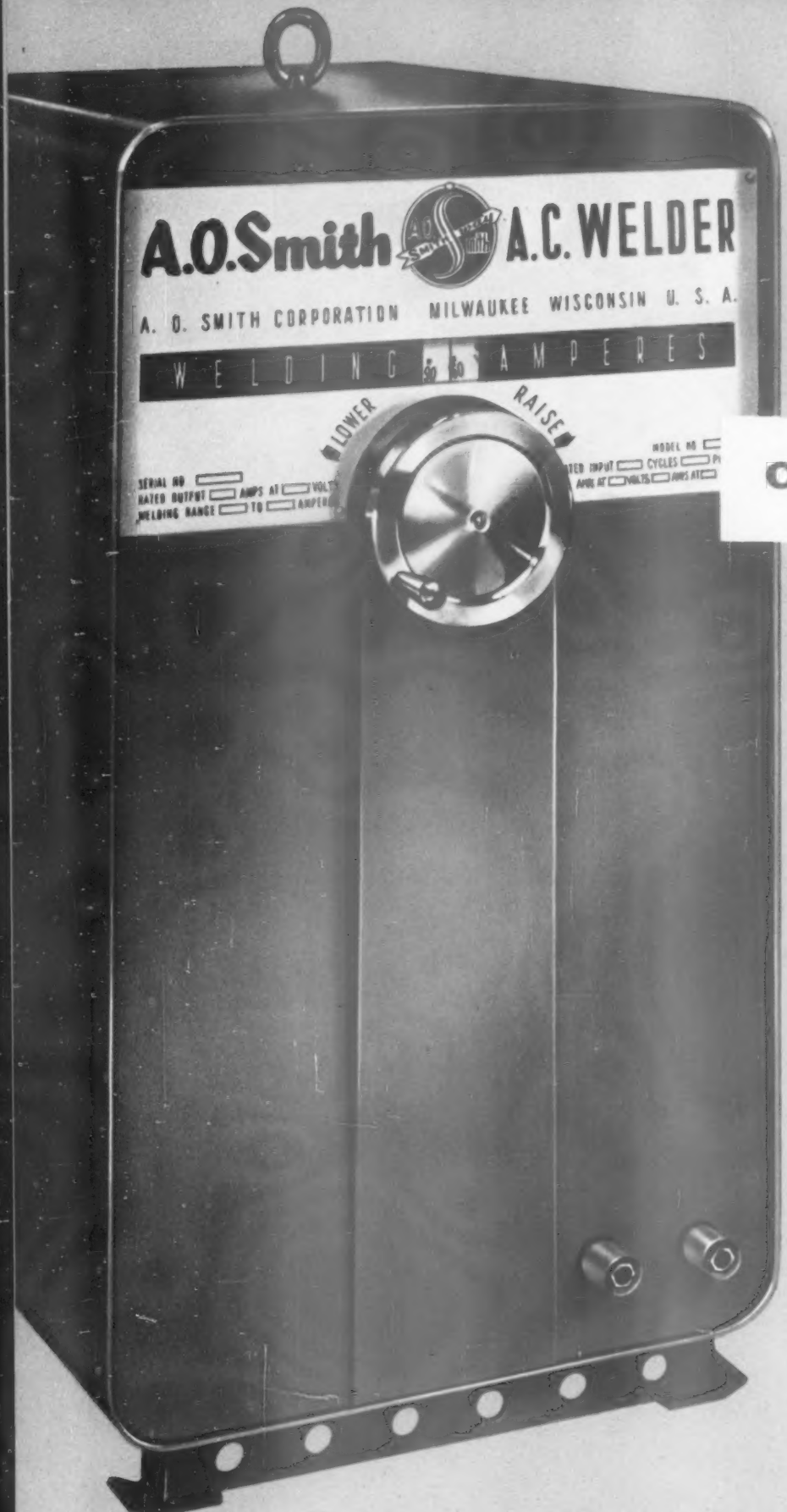

Cut your
welding
costs
with
A.O.Smith
welders

...and get all the



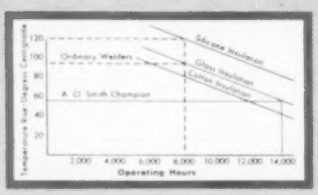
A. C. CHAMPION

heavy-duty welder

Designed and long proved the most dependable power source for continuous operation on the most demanding welding assignments at full rated output.

The CHAMPION has enough copper, plus downdraft ventilation, to assure no more than a 55° C. temperature rise when operating at full rated output. This means almost twice the operating life of any comparable heavy-duty welder!

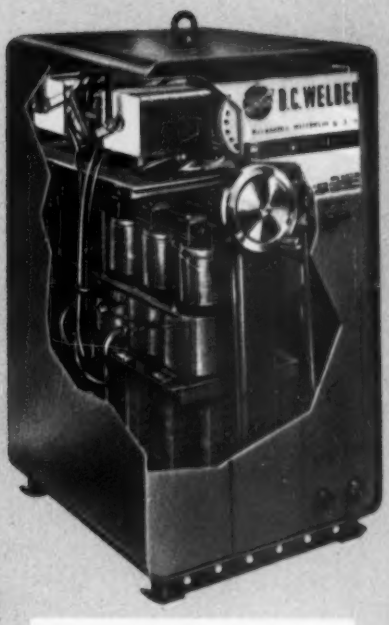
75 open circuit volts for high-speed welding with a faster and smoother arc! You can "drag the arc" on rapid work and weld low-hydrogen electrodes without "pop-outs." All-weather case makes it as useful outside as in the shop. Available in 300-, 400- and 500-amp models.



The A. C. UTILITY for **farms, garages, machine shops** with dual welding range: 25-90 amps., 35-180 amps

extra benefits

which A. O. Smith design and engineering provide!

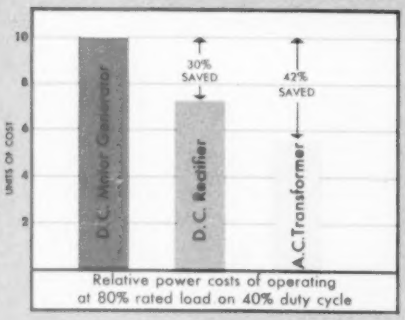


D. C.
RECTIFIER
heavy-duty welder

Here is a complete line of N.E.M.A.-rated welding power sources that operate without a single, heavy, rotating part! No motor (other than ventilating fan) and no generator . . . nothing to wear, no commutators to corrode or turn down, no bearings or brushes to replace! Yet they provide a better welding current for all types of work, and operate with unmatched efficiency!

SAVE POWER

Power costs of operating 400-amp. welders are charted below, providing an opportunity to compare motor-generator, rectifier, and AC transformer demands on 40% duty cycle.



Relative power costs of operating at 80% rated load on 40% duty cycle

The savings in power effected by transformer type machines over motor generators result from the improved efficiency under load of the A. C. transformer (85% to 88%) and the D. C. Rectifier (69% to 72%) over the D. C. Motor Generator (45% to 50%), plus the ability of transformer and rectifier to deliver full welding current instantly, when demanded, without requiring large idle-time power to keep rotating parts in motion. The savings are real. In fact, many manufacturers have found that a new transformer will practically pay for itself in a year! Ask your A. O. Smith distributor or representative to show you how, at your next opportunity.

SAVE OTHER COSTS

You save more than power costs when M.G. sets are replaced by A. O. Smith welding machines. Rectifier and transformer welding current inherently has less arc blow, and that means higher quality welds, faster welding speeds and less spatter. It also means greater overall operator efficiency, which assures better weldments, less weld repair and gives the operator greater pride in his work. The result: more money saved and production improved!

Because there are no moving parts, A. O. Smith welders require practically no maintenance. Quiet in operation, they are built to stand up under gruelling production schedules.

Modern successor to the cumbersome, troublesome, lumbering motor-generator set! This welding power source provides smoother arc performance, more dependable amperage at all times, instant striking arcs, and uses power only when welding! It's the only rectifier-type welder designed with high-velocity down-draft ventilation, which draws cool air in over the rectifier stacks before blasting it through the machine. Even when short-circuited at full rated amperage setting, the rectifier stacks remain below critical temperature! Stepless amperage control, effortless and accurate over the full range, assures exactly the desired setting for any job. The three-phase transformer coils are precision wound, of heavy copper, for long service life. Available in 200-, 300- and 400-amp. models.

The **A. C. CHALLENGER** all-purpose welder 200-, 300- and 400-amp. models

The **A. C. AUTO-MAN** for automatic or manual use 650-amp. model, up to 4-unit multiples available

There are A. O. Smith welding power sources for every welding need, built to the highest standards in the industry and of advanced design that makes them more desirable than any other make. Job proved in the shops of the world's largest user of welding as a production tool!

It will pay you to replace M.G. sets with A. O. Smith welders. May we suggest that you write us or contact your local A. O. Smith distributor for full particulars.

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION, Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Highest Quality Welding Electrodes

Mild Steel	AWS Class	E6010	E6011	E6012	E6012	E6013	E6013	E6020
	A. O. Smith	SW10	SW14	SW11	SW17	SW15	SW16	SW35

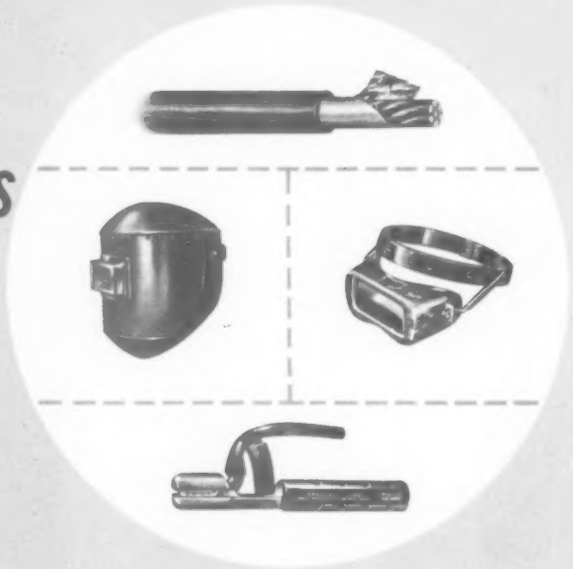
High Tensile	AWS Class	E7010	E7010	E7020	E8013	E9010	E9013	E10013	E10020
	A. O. Smith	SW75	SW80	SW78	SW86	SW95	SW87	SW88	SW101

Low Hydrogen	AWS Class	E6016	E6016	E7016	E8016	E9016	E9016	E10016	E12015	E12016
	A. O. Smith	SW64	SW65	SW84	SW81	SW90	SW89	SW100	SW120	SW103

Stainless	AISI Class	502	505	410	430	308	308	309	309	310	310	310	310	310	316	317	318	347	347
	A. O. Smith	SW151	SW152	SW153	SW154	SW162	SW362	SW166	SW167	SW159	SW359	SW169	SW168	SW368	SW160	SW161	SW158	SW157	SW357

Complete line of welding accessories

All the essentials to put welding to work are available through A. O. Smith. Quality welding cable, connectors, splicers, ground clamps, tongs, and holders; helmets, shields, gloves, and protective clothing; electrode storage ovens, machines and electrodes ... everything required for welding can be had from one responsible source. Take advantage of this for all your welding needs.



A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Made by welders . . . for welders

Here's the NEWEST ADDITION to Worthington's welding positioner line

It's the new, heavy-duty precision welding positioner with the 7 features you've always wanted in one unit

1. PRECISION GEAR AND PINION DRIVE for accurate adjustment and minimum backlash. Self-locking worm reducer provides safety factor in case of power failure. All gears are machine-cut.

2. SPECIALLY-DESIGNED VARIABLE SPEED DRIVE provides stepless speed change from zero to predetermined top speed.

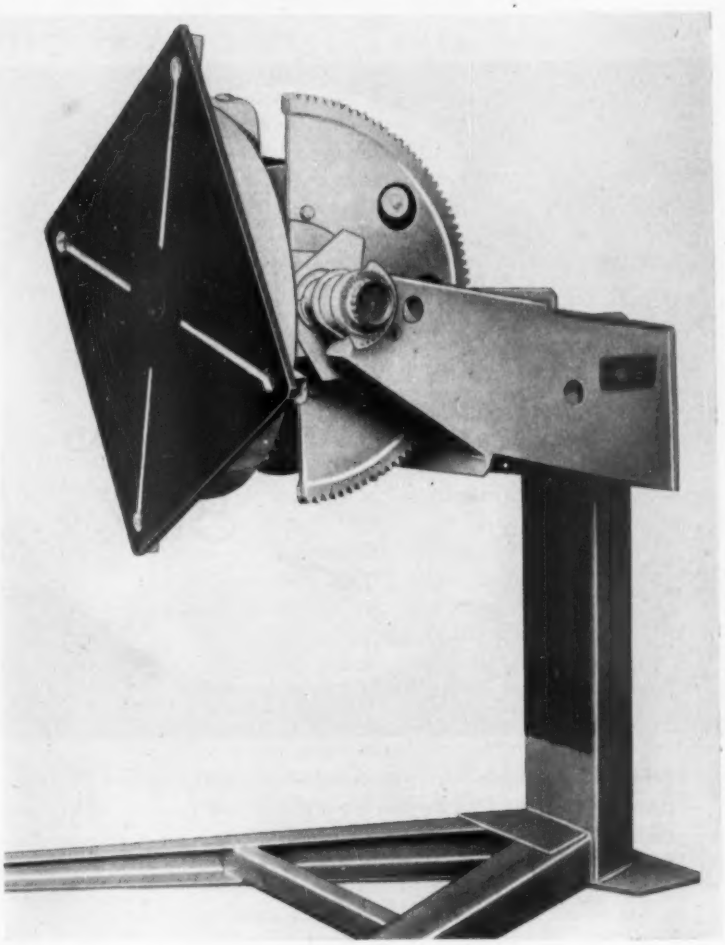
3. FAST-MOVING TILT TABLE with tilt indicator for accurate location of work at the best welding angle.

4. BUILT-IN HIGH-CAPACITY GROUND giving resistance-free return of welding current results in more uniform welds.

5. SPHERICAL SELF-ALIGNING YOKE BEARINGS eliminate misalignment.

6. HEAVY-DUTY FABRICATED STEEL POST, machined on front surface for easier raising and lowering of positioner. Positioner can be mounted on your column or wall by removing standard post.

7. MAGNETIC REVERSING STARTERS and push button controls provide for both rotation and tilt drives.



See these at the National Metal Exposition, 2111 Upper Exhibition Hall, Cleveland Public Auditorium, Cleveland, Ohio.

Y.3.4

The new Worthington positioners come in 2500, 3000, and 6000 lb. capacity sizes. Get more facts by sending the coupon to Worthington Corporation, Section Y.3.4, Plainfield, New Jersey.

WORTHINGTON

WORTHINGTON CORPORATION

Section Y.3.4 **Plainfield, New Jersey**

I'd like to know more about your new welding positioner.

☐ Please send me one of your bulletins.

☐ Have one of your sales engineers call on me.

NAME .....

COMPANY .....

ADDRESS .....

CITY.....ZONE.....STATE.....

JETWELD

NOW, Lincoln joins *powdered metal* with the electrode to utilize the heat of the arc more efficiently . . . to achieve fastest hand welding speeds ever accomplished . . . with new quality standards.

Jetweld is a shielded-arc type electrode designed for fast, easy operation with AC or DC. Powdered metal in the coating makes welds amazingly crack resistant, provides extra impact properties not found in conventional E-6012 electrodes. Welds compare in appearance with "hidden-arc" welds.

Operators like Jetweld for its smooth, stable arc action . . . its remarkable improvement in resistance to arc blow. Spatter is practically nil . . . welds are self-cleaning. Bead shape is flat.

Jetweld is designed for horizontal and flat position fillets, horizontal and flat position laps, single and multiple pass butts. It meets the physical requirements of a class E-7016 electrode and is used on work formerly calling for E-6012 and E-6020 electrodes.

JETWELD cuts deep into the 86¢ out of every welding dollar that goes for labor and overhead . . . can save you $14,190 per carload. Here's why:

FASTER WELDING—Jetweld's higher deposition rate now makes it possible for you to save enough money to warrant scrapping existing supplies of conventional E-6012 electrodes. Easier to restrike when cold, Jetweld simplifies tack welding. Simple to operate . . . Jetweld is a "drag" electrode with exceptionally stable arc characteristics.

HIGHER QUALITY—Weld metal is uniform, of X-ray quality, free of undercut with improved impact values at low temperatures. Jetweld is ideally suited for welding higher-carbon steels normally welded with low-hydrogen electrodes . . . without cracking and without surface holes There is no coating breakdown . . . stub losses are less.

GET JETWELD'S COST-CUTTING FACTS TODAY. . . Your Lincoln field engineers will gladly demonstrate how new Jetweld accomplishes the savings shown above. Full details are in Lincoln Bulletin 481, write Dept. 1712:

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

DECEMBER, 1953

Christmas Is Coming, Too!

IF YOU have youngsters, you have probably noted their reluctance to stop play and come into the house for some distasteful activity like studying. I was that kind of youngster. When my dad would call me, I would answer, "I'm coming" without making any effort to hurry. His apt retort was: "Christmas is coming, too."

Well, Christmas is only three weeks away, and when you look at the progress made in some phases of welding, you will see that we haven't advanced a bit over where we were last Christmas. I am referring particularly to the use of welding in the structural field.

One reason why structural engineers and architects are so reluctant to use welded construction for buildings may be the propaganda that is being fed to them by steel fabricators who still have punch presses and riveting equipment around their shops. I can think of no other reason.

Articles have appeared consistently in THE WELDING ENGINEER and other magazines to prove with facts and figures that the dollar savings through the use of welded construction can amount to a considerable sum. Total cost savings have amounted to as much as 33%, while material savings may run from 15 to 20%. By providing a stronger joint, welding makes it possible to use lighter material and effect a consequent saving in construction costs.

Some diehards will tell you that they are not sure about the strength of welded joints. Either they know nothing about the extensive research programs that have been carried on to prove the strength of welded joints, or they are wilfully blind to such data.

Several colored slides of earthquake damage in a California locality were exhibited by one of the speakers at the American Welding Society's annual convention (page 51). A welded schoolhouse remained standing unharmed after the quake while houses all around it were demolished. Does this look like weakness in welded construction?

SOME, when you pin them down, will complain that welding involves a "human factor" that they are unable to evaluate. This old bugaboo has just about worn out its usefulness as an alibi. Nine times out of ten, the records have proved, the human error in welded construction is overwelding. The natural tendency of a weldor is to deposit too much rather than too little weld metal.

Overwelding can be a costly fault. Deposited weld metal is far more expensive than the cents per lb cost of the electrodes. The man-hours spent in welding, and the cost of operating the equipment, must be added to the electrode costs to secure the cost of the deposited weld metal. If that cost is too high, it can wipe out any savings that would otherwise be realized from the use of welding.

THE mossbacks and turtleshells who oppose welded buildings, however, are not thinking along those lines. Their complaint is not that too much metal is deposited but that "the joint is too weak." That charge just won't stand up in court. All the available evidence is against it.

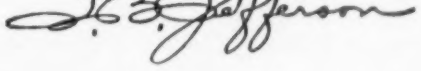
Recently, a member of the building commission's staff in one of our important cities told me about the "up and coming" program of his town. He said:

"We allow the use of welding in our buildings. Of course, the weldor must pass an examination, as well as his standard welding test, and he must be reexamined each year. Every joint in the building is inspected and stamped with the mark of the weldor and inspector . . .", etc., etc.

I questioned him about competing processes. No, they do not have a similar program for riveted or bolted construction. They have never had such a program, nor are they planning to institute one. Such rigorous inspection measures are deemed necessary only for welded construction.

Why the discrimination? I do not know, but I do know that there are a great many other code-making authorities who look upon welding as something that ought to be confined within a straitjacket.

We in the welding industry have a tremendous educational job to do. Welded construction is coming along, yes. But Christmas is coming, too. And a great many Christmases will come and go before we get anywhere at our present rate of progress.



Made to Last by Hard-Facing

19 LIVES FOR CONCRETE MIXER BLADES

Concrete mixer blades hard-faced with HAYSTELLITE tungsten carbide rod have 19 times the life of unprotected cast steel blades. The hard-faced blades, used in making concrete blocks, now give 20 months of tough service operating 24 hours a day, six days a week. Unprotected blades had to be replaced every four to five weeks.

NO MORE MONTHLY MAINTENANCE

This mud gun screw lasts for 8 to 10 months after being hard-faced with HAYNES STELLITE alloy No. 1. A single application of HAYNES STELLITE hard-facing rod eliminates at least seven shutdowns for repair. The screws previously had to be built up every month with steel rod because of severe wear on the flights.

DOUBLES THE LIFE OF DITCHER TEETH

Hard-faced teeth on ditching machines last from two to three times longer than unprotected ones. Hard-facing with HAYSTELLITE tube rod gives the teeth the added abrasion resistance needed to tear through clay, sand, shale, sandstone, rocks, and fragments of paving material. It takes only 40 seconds per tooth to apply the rod on this special jig.

Hard-facing can solve many of your maintenance problems. For more information, contact the nearest Haynes Stellite Company office.

"Haynes," "Haystellite," and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

HAYNES *alloys*

Trade-Mark

Hard-facing products made from cobalt-base alloys, nickel-base alloys, iron-base alloys, and tungsten carbide, in the form of rod, wire, and coils.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

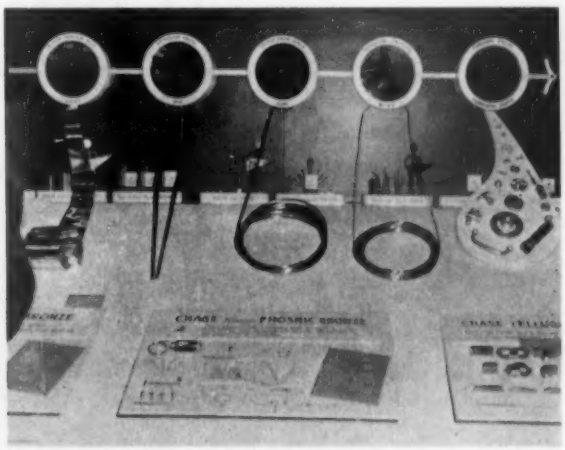
100,000 Attend Show

ALL previous records were smashed at the 35th National Metal Exposition. Clocked attendance was around 100,000 and registered attendance nearly 45,000. The 462 exhibitors represented the largest number ever signing up for a Metal Show.

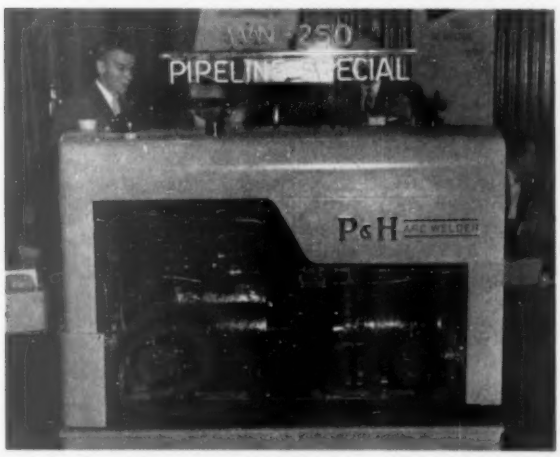
Not pictured here but worth mentioning: One enterprising exhibitor, mindful of entertainment rooms, displayed a basketful of nationally advertised headache remedies and invited you to help yourself. Another showed a flying saucer whose porthole snapped your picture when you peeped in to investigate. Several featured intelligence tests, and one gave badges "Genius" or "Expert" to those who took least time to answer correctly.

WILLIE the Weldor was put together from electrode cartons, safety gloves and welding helmet

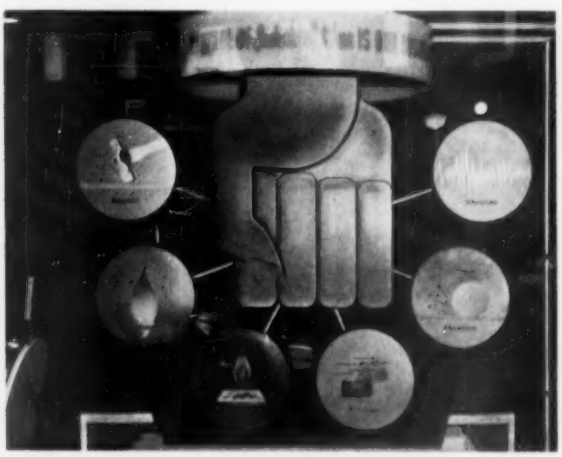
WELDER was given a shower bath periodically. Girl pantomimed the spiel, and the audience used earphones



BRASS products came out on an endless belt like the figures in those noted clocks of the Middle Ages



WELDER case was cut out to demonstrate the workings of the innards. One of many new products demonstrated



COLOR and lights heightened this handsome display to show various types of wear encountered in service

ADAMS LECTURE: R. B. Shepheard told his American audience about the problems of British shipbuilding

ENTERTAINMENT: This dancing lady appeared on the magnificent program that followed the annual dinner

What Happened in

Big events of the welding year, outstanding new developments, forecasts of things to come . . . you will find them all in this "bird's eye-view" account of the American Welding Society's annual convention.

BY CLYDE B. CLASON

THEY came to Cleveland from the four quarters of the United States —some from as far away as England and Japan. And by some miracle five summer days were displaced into mid-October to provide perfect weather for the 34th annual meeting of the American Welding Society.

With the official registration at 1,406, the Hotel Cleveland was packed to overflowing. Cots had to be moved into single bedrooms—and then into parlors and salesman's sample rooms. Some unlucky late arrivals had to go as far away as Akron to secure sleeping quarters during the big week. But everybody seemed to be having a wonderful time.

"It has been a good year, one of steady growth," said President Fred L. Plummer in officially opening the meeting on Monday October 19. "Our membership increased by nearly 18%. We now have 9,349 members —by far the largest number in the history of the Society."

The Society plans to hold its second spring technical meeting May 4-7 in Buffalo, as previously announced. The 35th annual meeting, however, will be held next November in Chicago in conjunction with the National Metal Exposition. The Society, President Plummer announced, has agreed to continue its participation in the Metal Show for another five years but will also continue to hold separate welding shows in the spring.

The Adams Lecture

Rex Beaumont Shepheard crossed the Atlantic ocean to deliver the annual Adams Lecture, which was on the use of welding in British shipbuilding. In Great Britain, as in this country, notch brittleness has been found to have been a major factor in the welded ships that have failed. It is imperative to continue research in this subject as a top priority, said Shepheard, who is director of the Shipbuilding Conference, London, and is also a commander of the Order of the British Empire.

"The prevailing impression I have received here is one of warmth," Shepheard asserted in accepting the $100 honorarium and Adams Lecture Certificate. "Warmth of the atmosphere, where the temperature reached 85 Fahrenheit. Warmth in the technical discussions, which sometimes developed into real heat. Warmth of your welcome and the warmth of your friendship."

Another foreign visitor crossed a different ocean from Mr. Shepheard to arrive at the same place. The cheerful personality of Dr. Harujiro Sekiguchi, professor of Nagoya University, Nagoya, Japan, contributed much to the gaiety of the president's reception.

Awards and Prizes

The Samuel Wylie Miller Memorial Medal, highest honor that the Society can bestow, was presented this year to Harold O. Hill, of Bethlehem Steel Co., for his "unstinting devotion and wise counsel" in contributing to the advancement of the science and art of welding. This award and the Adams Lecture certificate were both presented during the annual dinner by President Plummer.

The Lincoln Gold Medal, another coveted honor, was presented during the opening Monday morning session to Walter S. Wooding, superintendent metals section, industrial test laboratory, Philadelphia Naval Shipyard, for his paper "The Inert-Gas-Shielded Metal-Arc Welding Process." Mr. Wooding, it will be remembered, delivered the annual Educational Lecture series on this same subject dur-

EDUCATION is symbolized by A. F. Davis, Lincoln Electric, and Frank Mooney, assistant secretary, AWS

METAL SHOW: Many new products to interest those in the welding field were displayed and demonstrated

Cleveland?

ing the 1952 AWS convention. The presentation was made by H. Malcolm Priest, U. S. Steel Corp., Pittsburgh, who was himself honored only a few minutes later with a certificate of honorary membership in AWS.

The Resistance Welder Manufacturers Association prize contest awards were presented by J. R. Barefoot, vice-president, the Federal Machine and Welder Co., Warren, O. The first prize of $750, industrial source, was awarded to Chester A. Czohara, manufacturing research department, International Harvester Co., Chicago, for a paper entitled "Design and Application of Edge Ring Welding."

The $500 second prize, industrial category, went to Glenn C. Woodmancy, an engineer with the Wichita division of Boeing Airplane Co., for a paper "Balancing Inverse Parallel Connected Ignitrons in Frequency Converter Spot Welders Using Cathode-Ray Oscilloscope."

The $250 third prize, industrial source, was split among a trio of researchers. Paul Klain, research metallurgist, Dow Chemical Co., Paul Thorne, chief electrical engineer, National Electric Welding Machines Co., and Dean L. Knight, chief welding engineer, National Electric Welding Machines Co., were the authors of the third-prize paper, "Spot Welding of Magnesium with Three-Phase Low-Frequency Equipment."

As usual, metallurgists of Rensselaer Polytechnic Institute, Troy, N. Y., won the $300 first prize for the best paper from a university source. This paper was entitled "Temperature Distribution during Flash Welding of Steel, Part 2." Dr. Ernest F. Nippes, director of welding research in the Department of Metallurgical Engineering at Rensselaer, has been a contributor to the winning paper for three successive years. He was associated this year with four other researchers: Warren F. Savage, John J. McCarthy and Gordon Grotke, of the faculty or research staff at Rensselaer, and Sheridan Smith, now a resident of Chicago.

Second prize in the university category went to W. B. Kouwenhoven, dean of engineering and professor of electrical engineering at Johns Hopkins, and Dr. Clarence W. Little, Jr., group leader in the physics section of Allis-Chalmers Mfg. Company's research division, for their joint paper "Contact Resistance."

The $250 prize-winning paper from an undergraduate university student was written by Carl E. Dorschu, who was graduated from Drexel Institute last June. Dorschu is now employed as a design engineer at the aviation gas turbine division of Westinghouse Electric Co. His subject was the spot and seam welding of low-alloy steels to stainless steels.

The A. F. Davis Undergraduate Welding Awards were all presented by Julius Heuschkel, Westinghouse Electric Corp., in his capacity as chairman of the education committee. The first prize of $200 went to Otto P. Eberlein and Roger C. Waugh, Cornell University, for their paper "Penetration Factors in Metal-Arc Welding," published in the *Cornell Engineer*. The second prize of $150 was given to Wayne Jacobs and Charles Marshall, University of Wisconsin, for a paper "A Comparison of the Quality of Weldments Prepared by Different Welding Processes" published in the *Wisconsin Engineer*.

Educational Lectures

This year's Educational Lectures were particularly good numbers, in the opinion of your reporter. The general theme was the "Scientific Basis of Welding." The first two lectures were delivered by Dr. Harry Udin, assistant professor of metallurgy, Massachusetts Institute of Technology, and the third by Edward Ross Funk, engineering consultant, Goodyear Aircraft Co., Cleveland.

The aim of this series of lectures was to get down to fundamentals (or perhaps below fundamentals to the very elements themselves) and then build up again but with a better understanding. As an example, Dr. Udin's first lecture was devoted mainly to the physical and chemical char-

Awards and Prizes . . .

OTTO P. EBERLEIN, Cornell University, receives $200 first prize in A. F. Davis undergraduate awards

CHESTER A. CZOHARA (right) receives top award, industrial, from J. Roy Barefoot, president of RWMA

acteristics of a metal surface. Under the microscope, we see that such a surface consists, from the top down, of a layer of adsorbed liquid or vapor, then a layer of oxide and finally the metal. If it were not for the liquid and oxide layers, metal surfaces could be welded by contact only. Since no cleaning method, no matter how efficient, can ever remove all the upper layers, it is necessary to supplement physical contact of the surfaces with either heat or pressure or both heat and pressure.

In his second lecture, Dr. Udin called upon physics and chemistry to introduce some new fundamentals behind flame temperatures. Dr. Funk's lecture showed how the application of fundamentals many years ago would have resulted in a more satisfactory tensile test for weld-metal specimens than the one we now have. To prove it, he exhibited a series of stress-strain curves for weld and base metals.

All three lectures were stimulating and a challenge to the imagination. Our hats are off to the two lecturers, to Professor L. E. Wagner, University of Michigan, who served as chairman, and to the AWS education committee, which also sponsored a very good technical session on what should be taught at engineering schools with regard to welding.

How AWS Is Growing

The Henry Neitzel Membership Awards were presented at the section and district officers' dinner on Wednesday evening. This Society is growing; it now has 68 sections serving important areas of American industry and 105 activity and technical committees. Fastest growing sections from the standpoints of new members last year were:

1. Houston. Gain of 137 members.
2. Detroit and Los Angeles. Each gained 125 members.
3. Pascagoula. 55 members.
4. Birmingham. 44 members.
5. New York. 39 members.

From the percentage standpoint, the following sections registered the greatest gains over a year ago:

1. Pascagoula, 148.7%.
2. Birmingham, 68.8%.
3. Houston, 54.8%.
4. Los Angeles, 40.7%.
5. Long Beach, 39.5%.

Tanks for Armed Forces

Two plant tours were conducted for the benefit of the visiting firemen: one to the Euclid Road Machinery Co. and the other to the Cleveland tank plant of Cadillac Motor Car Division, GMC. "We do a little welding here," modestly admitted H. R. Boyer, plant manager of the tank plant, in welcoming his security-cleared visitors. As a matter of sober fact, more people are engaged in welding at this plant than in any other single job classification, and about 1,500 lb of electrodes are consumed for every vehicle. A lot of the welding is done on "merry-go-rounds," which are similar to conveyors in that they bring the work to the workers. After tank turrets and hulls have been tack welded, they are placed on positioners, which move on a conveyor belt from one station to the next. Final assembly of a military tank also takes place on a production line.

A few facts about the Cleveland tank plant: it covers 53 acres of floor space, has a 710-ft final assembly line and is equipped with more than 4,000 production machines as well as huge craneways for moving heavy tank components.

The Euclid Road Machinery plant showed the visitors who chose this tour some beautiful applications of submerged-arc welding and automatic hardfacing. This plant makes mostly trucks, all of which are all-welded products. Production is handled on heavy positioners.

Fusion Welding of Titanium

Random sampling of the 59 papers presented at the 19 technical sessions revealed several new developments. For instance, it has been believed that titanium is difficult, if not impossible, to weld satisfactorily by a fusion-welding process. Now comes Francis H. Stevenson, Aerojet-General Corp., Azusa, Calif., to show that the techniques used to produce acceptable welds in commercially pure titanium (Ti-75A and RC-70) do not involve difficult procedures. All welds discussed in Mr. Stevenson's paper were made by means of the tungsten inert-gas process. Helium was used as the shielding gas when the welds were made mechanically because less amperage is needed and a narrower weld with full penetration can be more easily obtained. Argon was used, however, when the welds were made manually because it is a "cooler" gas and easier on the weldor. The welds were all made under shop conditions using standard inert-gas equipment.

Some of Mr. Stevenson's conclusions:

FRED PLUMMER, president, AWS, presents Adams Lecture certificate to British visitor R. B. Shepheard

HIGH honor of Samuel Wylie Miller Medal was given to Harold O. Hill (right), AWS president in 1947-1948

1. The weld must be shielded carefully until it cools to approximately 400 F.

2. Welding procedures must be so designed that the number of welds coming together at any one point is a minimum.

3. No benefit has been realized from stress relief of the welded joints.

Chain Flame-Cutting

Another new development is in flame-cutting. This was described in a long but very meaty paper given by Howard B. Cary, divisional superintendent, Marion Power Shovel Co., Marion, O. The electronic eye tracer is not the ultimate in production shape cutting, according to Mr. Cary; it is only a step leading to a complete process that he called "electronic eye chain flame-cutting."

In 1949, a paper by R. F. Helmkamp and A. H. Yoch mentioned the use of the electronic tracer to do continuous production cutting of like or dissimilar pieces by making a continuous template. Bridging members are provided that carry the cut along yet allow the pieces to be almost completely severed. In 1950, a paper by W. O. Springer referred to the use of internested templates to use up scrap. These two references gave the technicians at Marion Power Shovel their big idea; namely, to nest on one template all parts of a particular plate thickness going into a given weldment.

The first test was on a small bracket, which was designed entirely from $\frac{3}{4}$-in. plate except for two heavy rough-machined bosses. With 13 plate items, the total weight of the completed weldment is about 200 lb. Components are cut by a machine equipped with an electronic tracer. The base material of the template is black pressed-wood (Masonite), and the outline was provided by white Scotch tape. "We made several single-item templates with white Scotch tape on black pressed-wood and found that they could be made in less time than the white paper cutouts," said Mr. Cary.

With the first template, it was possible to cut out without stopping eight small triangular pieces and the inside of the base plate. Links had to be left, of course, holding all of the pieces together; however, the cutting of these tie members did not prove to be a problem. The parts were quickly severed from each other with a hand torch.

Engineering changes on a few parts can prove troublesome when production chain flame-cutting is being employed. If a part's size is increased or the geometry changed so that interference occurs between adjoining pieces, then several parts must be shifted. Worst of all are the changes that require the part to be made of a different thickness.

In concluding, Mr. Cary challenged manufacturers of flame-cutting equipment to increase width of the cutting range from the present maximum of 144 to 180 in. This will enable twin-torch operation on 90-in. plate, the maximum plate width obtainable.

3-D Slides

A neat bit of showmanship was introduced by L. K. Stringham, Lincoln Electric Co., who had three-dimensional viewing glasses handed to each man as he entered the room. Stringham used two screens: one for conventional slides and one for 3-D colored slides of various weldments. His paper was on the development of a new "agglomerated" flux for automatic welding.

To make this type of flux, the finely ground ingredients are perfectly proportioned, mixed with a binder, dried, then ground to the proper size. Each grain of the agglomerate contains hundreds of grains of the original ingredients. Some of the 3-D slides showed the structure, a grain the size of a pinhead being blown up to the size of a football on the screen. Deoxidizers and ferro-alloys, as well as ingredients for hardfacing, can be satisfactorily added to this type of flux, asserted Stringham.

Multiple-Electrode Standards

D. E. Knight, Linde Air Products Co., suggested a system of standardized nomenclature to simplify the present often badly confused terms of multiple-electrode submerged-arc welding. The power connections, he said, can be divided into three main groups:

Group I, Multiple. More than one power source is used. Each electrode has its own power supply, welding head and control voltage mechanism. Two- or three-phase power or any combination of a-c and d-c can be supplied to the electrodes. Welding ground is attached to the workpiece.

Group II, Parallel. One power source. The electrodes are connected in parallel to the power source, and a welding ground is attached to the

H. MALCOLM PRIEST (right), U. S. Steel Corp., was presented an honorary lifetime membership in the AWS

FIRST VEEP Joe H. Humberstone stands beside the placard announcing Neitzel Membership Award winners

workpiece. A single welding head is governed by one voltage control unit. Both rods are fed at once.

Group III, Series. Two welding heads, each having its own voltage control unit. The two electrodes are connected in series so that the welding current passes from one electrode to the other and then back to the generator or transformer. Workpiece is not included in the welding circuit.

With any of these power connections, different effects can be produced by changing the position of the electrode with respect to the line of weld travel. In the tandem position, one electrode is behind the other; in the transverse position, the electrodes are side by side in a line at right angles to the direction of welding. With three or more electrodes, other patterns are possible such as a triangle, circle, star, echelon, etc.

When two electrodes are used, the number need not be specified in Mr. Knight's suggested nomenclature. Such descriptions as "d-c parallel-tandem" or "a-c series-transverse" are enough to tell the whole story. When three or more electrodes are used, the number should always be included; for example, "Three-electrode parallel-transverse" welding. An excellent idea, Mr. Knight!

Mig Welding

Several good papers were given on various phases of inert-gas arc welding. The one by R. W. Tuthill, supervisor, a-c development engineering, Welding Department, General Electric Co., presented interesting information on the welding arc that occurs in metal inert-gas welding.

The Mig welding arc is radically different from other welding arcs, declared Mr. Tuthill. As the current density is increased on the electrode, the droplets forming at the end of the wire decrease in size and increase in rate to the point where they cease to short circuit the electrode and work at any instant. At normal arc lengths, the current density at which this transition from large to small droplets occurs is high (about 30,000 amp per sq in. on 3/32-in. electrodes) and increasingly higher (200,000 amp per sq in.) when using smaller electrodes (0.030-in. diameter). Naturally, these high current densities cause rapid burn-off rates of the electrode. Hence, travel speeds are also proportionally higher compared to conventional metal-arc welding.

Using the data from a series of tests at different wire-feeding speeds, Mr. Tuthill plotted arc voltage versus feeding speed (arc current) for a constant arc length. For any given electrode, such as 0.030-in. aluminum wire, this gave a family of curves, each representing a different arc length.

The curves of constant arc length were all rising. This means that the arc voltage must be increased as the wire-feeding speed is increased if the constant arc length is to be maintained. (In Mig welding, it is not possible for the weldor to make any permanent change in arc length by manipulating the electrode holder or welding gun.)

Tuthill's experiments indicate that aluminum wire as small as 0.015 in. can be successfully used in the Mig process. Very high feeding speeds, about 1,000 ipm, are needed in order to permit sufficient current to flow (50 amp) for proper arcing. At such current, 1/32-in. aluminum is readily weldable by the Mig process.

Harmful Rectification

Harmful effects of the current rectification that occurs because of high-frequency stabilization superimposed upon tungsten inert-gas welding current were discussed by John Murray, engineering department, The Lincoln Electric Co., Cleveland.

"To explain what rectification is, we must first consider the welding current wave shape of the a-c transformer-type welder," said Mr. Murray. "When used on conventional arc welding, it is primarily sinusoidal.

"Going to a tungsten electrode and an aluminum plate, apparently, when the tungsten is negative the electron emission is better than when the tungsten is positive. This causes a larger current loop when we have straight polarity than when we have reverse polarity. For one complete cycle, we have effectively a direct-current component of straight polarity. The introduction of this d-c component is called rectification."

If the d-c component is present in small percentage, it may not cause trouble. This is the case on heavier plate. On thin-gage material, however, the troublesome d-c component can overcome the effective advantage of the alternating current. Because the direct current flow, while welding is being done, circulates through the secondary of the transformer, the end result of a d-c component is often a burned-out transformer.

To eliminate or minimize rectification, Mr. Murray offered two alternatives: condensers or batteries. Condensers naturally act as a block to any d-c component but are expensive. Lead-acid storage batteries, which

are rugged and relatively inexpensive, do a satisfactory job of cancelling out the d-c component.

Mig Welding of Steel

The paper by T. McElrath, Jr., and R. T. Telford, both of Linde Air Products Co., revealed the interesting fact that in shipyards, both American and Canadian, Mig welding costs have been found to average 20 to 30% lower than the cost of conventional metal-arc welding, despite the extra cost of the shielding gas and higher material costs for the filler wire. The principal trouble is that up to now welds of code quality can usually be made only on deoxidized or "killed" carbon steels. The authors undertook a study to learn the specific causes of the porosity found in other types of steel, came up with the conclusion that the culprit is a carbon-oxygen reaction in the molten weld metal. This reaction gives birth to carbon monoxide and carbon dioxide, both gases being trapped in the solidifying puddle. A "whipping" technique, in which the arc was rapidly oscillated forward and backward in the direction of the seam, proved to be advantageous in lowering porosity.

What Messrs. McElrath and Telford had to say about carbon dioxide and carbon monoxide becomes specially interesting when considered with the findings of another pair of researchers: Harry C. Cook and Gilbert R. Rothschild, of Air Reduction Research Laboratories. These gentlemen also undertook a Mig welding study of carbon steel, using an electrode composition of 0.12-0.14% carbon, 1.08-1.12% manganese, 0.46-0.48% silicon, with phosphorus and sulphur being held to a maximum of 0.02%. They found that carbon monoxide and carbon dioxide are beneficial additions to the inert-gas shield as far as lack of porosity and tensile strength are concerned. A 5% addition of either carbon dioxide or carbon monoxide is a better addition to argon than the 1% oxygen that is now used. It was the introduction of oxy-argon mixtures about three years ago that first made Mig welding of carbon steel practicable.

Most recent refinement of the Mig welding process may prove to be a constant-potential power supply. This type of equipment offers the advantages of instantaneous arc ignition simplicity of welding and relative freedom from burnback, say W. H. Helmbrecht and R. L. Hackman, both of Linde Air Products Co.

R. C. McKinsey, Union Carbide and Carbon Research Laboratories, investigated stress-corrosion cracking of mild steel; that is, the cracking that occurs from the combined effects of corrosion and stress. The test steels were exposed to a boiling solution of 60% calcium nitrate, 3% ammonium nitrate and 37% water for relatively short periods of time. Cracking was almost entirely eliminated by stress relieving the welds prior to exposure at temperatures of 300-350 F. The stress relieving was done by two oxyacetylene flame heads, which were followed immediately by a water quench. The results of the laboratory tests were substantiated by field tests of relatively large welded plates. These plates were immersed in a large storage tank containing 85% ammonium nitrate solution for a period of ten months. Severe cracking took place in the as-welded plates but not in the low-temperature stress-relieved plates.

Earthquake Proof

Pictorial proof that welded construction can take bad earthquakes was exhibited by Lloyd J. Oye, Magnaflux Corp. A welded school building successfully withstood a recent California earthquake so severe that it demolished nearby houses and even twisted railroad rails in a tunnel.

A very good paper was given by Ray M. Kolb and R. C. Wheeler, Standard Oil Co. of Indiana, on the new welding shop at the Whiting refinery. The extent of this shop (42,000 sq ft, of which half is devoted entirely to welding) and its equipment left most members of the audience gasping for breath. Of special interest to your reporter was a mobile automatic welder that can be brought to any part of the shop. A steel mast is mounted in the center of a rubber-tired carriage 6 by 6 ft. The carriage bed is of heavy steel plate, and its size and weight are such that it is incapable of turning over. A boom projects horizontally from the mast and may be lowered up or down to suit the requirements of the job. The track for the welding head is mounted upon this boom.

Silver-Brazing Alloys

The problem of making corrosion-resistant silver-brazed joints in stainless steels engaged the expert attention of a trio of scattered researchers: George H. Sistare, metallurgist, Handy & Harman, Bridgeport, Conn.; John J. Halbig, Armco Steel Corp., Middletown, O.; and L. H. Grenell, Frigidaire Div., General Motors Corp., Dayton, O.

Nickel-free silver-brazed joints have little or no corrosion resistance when subjected to harshly corrosive saline solutions. Even in innocuous corrosion media, such as humid air or running tap water, the bond between a nickel-free silver-brazing alloy and a nickel-free stainless steel may fail in a few days.

It has been demonstrated, contend the three researchers, that a completely corrosion-resistant bond between a silver-brazing alloy and a nickel-free stainless steel depends on the deposition of a fairly uniform layer of nickel-rich constituent (from the brazing alloy) over the entire surface of the stainless steel covered by the brazing alloy.

The role of nickel in various types of silver alloys was found to vary from zero efficiency to 100% efficiency. There were four alloys in which the use of nickel was found to be completely effective. These are all eutectiferous copper-silver alloys (type 200 in the Tabular Survey). Their chemical compositions and flow points are:

223c: 50% silver, 36% copper, 6% manganese, 8% nickel; flow point 1,600 F.

233b: 63% silver, 28.5% copper, 6% tin, 2.5% nickel; flow point, 1,475 F.

233g: 60% silver, 28% copper, 10% tin, 2% nickel; flow point, 1,400 F.

263a: 43% silver, 37% copper, 15% manganese, 3% tin, 2% nickel; flow point, 1,475 F.

The use of silver and gold alloys for brazing various components employed in the electronic industry was discussed by A. W. Swift and R. J. Metzler, both of Handy & Harman. Their paper covered most known applications of these precious-metal brazing alloys, many of which have merit for electronic applications.

Cutting and Gouging

Myron D. Stepath, Arcair Co., gave details of a method of gouging and cutting metals by means of an electric arc combined with a high-velocity jet of compressed air. He included results of tests run to show the heat effects on adjacent surfaces

of the cut metal and on welds made thereon.

Principles of another arc-cutting process were reviewed by Helmut Thielsch and J. Quaas, both of Eutectic Welding Alloys Corp. This process, known as shielded metal-arc cutting, employs special electrode coating to provide the electrodes with their cutting or grooving power. Discussed in detail were: the condition of the groove surface, distortion, effect upon machinability, metallurgical, physical and chemical effects.

Resistance Welding

With only one technical session and four papers, resistance welding did not bulk so large at this convention as in former years. At previous conventions of the American Welding Society, up to three resistance-welding sessions have been held, with a correspondingly large number of papers. Of this year's contributions on resistance welding, the paper by Isaac S. Goodman, lamp engineering and design division of the Westinghouse Electric Corp., Bloomfield, N. J., probably ranked first in news value.

Mr. Goodman told how high-speed motion picture photography (1,000 to 10,000 frames per second) is now being applied to resistance welding. This technique was successfully applied to arc welding a few years ago and has led to many interesting studies of the welding arc. Mr. Goodman listed these r-w research projects in which high-speed photography shows promise of being a useful tool: follow-up on small bench welding heads, high-speed butt welding of small-diameter wires, percussive welding, vibration phenomena as applied to small welds.

Ferrous Alloys

A simplified test method to evaluate the hot cracking tendency of the more popular high-temperature alloys was described by W. R. Apblett and W. S. Pellini, both of Naval Research Laboratory. This consisted of a number of blocks of variable width, clamped together in a jig. These were fused together by Tig welding without filler metal. Examination of the welded specimens showed a separation between the abutting block surfaces just at the fusion line, which is caused by initial expansion and upset followed by shrinkage on cooling.

Nickel-manganese steel electrodes are now being supplanted with molybdenum - manganese steel electrodes for applications involving the repair and hardfacing of manganese steel. According to Messrs. Howard S. Avery and Henry J. Chapin, both of American Brake Shoe Co., the molybdenum-manganese grades are equivalent to the nickel-manganese electrodes in most respects and are superior in yield strength and flow resistance. As overlays, the new electrodes provide good wear resistance for many applications. They can be used in either manual or automatic arc welding and are unique in their ability to provide good welds when applied bare. The latter characteristic avoids the trouble and expense of the flux blanket customary in automatic (submerged-arc) welding.

A brazing process operating below the eutectic temperature is indicated as the best method to join nodular cast iron. It should be a fast process and operated without preheat in order to minimize the width of the region containing the martensite shells and the thickness of the shells themselves. These are the conclusions of Edward E. Hucke and Harry Udin, Massachusetts Institute of Technology, who have investigated the welding metallurgy of nodular cast iron. This material is more difficult to join than ordinary gray iron, they say, chiefly because it is a superior engineering metal and therefore requires superior joint physicals.

Aluminum plates $\frac{3}{8}$ in. thick were butt welded at Alcoa's aluminum research laboratories and subjected to fatigue tests. The results were covered in a triply-authored paper by E. C. Hartmann, Marshall Holt and I. D. Eaton. For 3S, Alclad 14S, A54S and 61S plates, little difference was found in the fatigue strength of joints having fatigue lives greater than 10^6 cycles. For fatigue lives of less than 10^4 cycles, the fatigue strengths rank in the same order as the static tensile strength of the joints.

Welded Bridge Construction

Two interesting papers were given on the construction of welded bridges. That by N. W. Morgan, principal highway bridge engineer, Bureau of Public Roads, used the historical approach. The early tendency, he said, was to apply welding to a structure laid out for riveting. Thus welded bridge construction has evolved from the simulated riveted truss. It has passed through the stage of multiple cover plate flange girders to arrive at the modern single-plate flange girder. Tendency is away from the use of structural shapes and toward the greater utilization of plates, involving thicker plates than are used in riveted bridges.

A practical example of welded construction was provided by the second bridge paper, written jointly by Camilo Piccone, civil engineer, Mexico, D. F., and Thomas C. Kavanagh, New York University. Their paper described the erection of a 250-ft all-welded splayed arch bridge over the Rio Blanco river near Vera Cruz in Mexico. Acclaimed as an outstanding example of modern bridge architecture, this structure has two outstanding features: (1) a merging of the slender arch ribs to form a space structure eliminating a major part of the lateral bracing and (2) a diagonal grid floor system of composite design, which has notable advantages with regard to economy and stiffness. This bridge, say Piccone and Kavanagh, demonstrates that the same freedom of form formerly possessed only by concrete can now also be attained with steel.

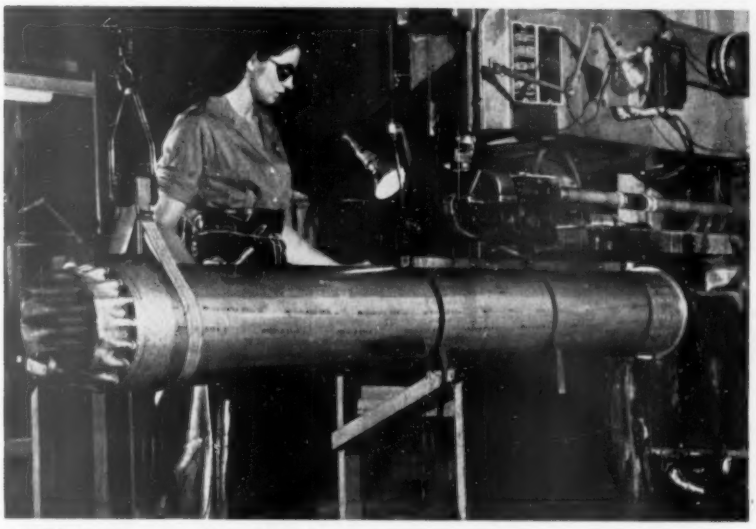
Credit Where Due

Please remember the Cleveland men who labored so hard to make this convention a success. Some of the names that should be noted are: M. S. Shane, chairman, national arrangements committee; R. J. Yarrow and J. R. Henry, who planned the annual dinner and the magnificent program of entertainment that followed it; E. T. Scott and R. J. Kriz, the demon salesmen who together accounted for the sale of 346 dinner tickets; Clayt Herrick, who saw that everybody had a wonderful time at the president's reception; Tom J. Lawless, head of the committee that planned the superb program for the ladies; Otto J. Bornemann, in charge of registration and signs, and Ray W. Metzger, who sold three times as many memberships as were ever sold at an AWS convention.

The writer would also like to say a word of praise for Harry C. Boardman, who served as chairman of the national program committee, and Julius Heuschkel, chairman of the education committee. Both committees did a real job.

CORRUGATED tube is 12½ in. in diameter. Outer shroud is only 12 inches

Smaller Tube Fitted . . .



INDIRECT spot welding joins the outer shroud and corrugated inner tube

. . . . over Bigger One

BY P. M. KLAUBER

How do you slide a 10-ft-long metal tube 12 in. in diameter over one that is 12½ in. in diameter? Sounds impossible, doesn't it? Yet this unusual metalworking problem was solved at Solar Aircraft Co., San Diego, Calif., by means of a vacuum. The technique is, as far as the company knows, unique.

The peculiar necessity of sliding the smaller tube outside of the larger one arose in the manufacture of augmentors for the Convair-Liner 240. The augmentors are large tubes installed on piston engine aircraft, which utilize the exhaust gases to give the plane forward thrust, help cool the engine and provide warm air for cabin heating and anti-icing.

Two major components of the augmentors are a corrugated tube and an outer shroud. Both items are made of type 321 stainless steel; the corrugated tube is 0.050 in. thick and the outer tube is 0.025 in. The corrugated tube is about 124 in. long and 12½ in. across; the shroud is of the same length and about 12 in. Though the corrugated tube goes on the outside, it is fabricated to a larger diameter because the corrugations must fit tightly to the outer shroud along their entire length. The corrugations are later welded, and a smooth weld is required to avoid cracking.

A Solar research engineer conceived the idea of evacuating the corrugated tube. This would shrink it, he said, so that the outer shell would slide on smoothly. After various procedures had been tried, the present method was adopted, as follows:

A large wooden fixture (maple was used to prevent scratches) was built to fit inside the corrugated tube and prevent it from collapsing. There are slats to fit into each corrugation. Rubber-covered metal ends were built to fit snugly over the wooden form and the corrugated tube. Finally, a vacuum pump was attached to one end.

Air pressure at sea level is equivalent to the weight of a column of mercury of height 760 mm (29.92 in.). This was reduced to between 10 and 18 in. by the vacuum pump. The result was that the corrugated tube shrank inwardly, just like a rubber balloon when you let out some of the air. The tube diameter came down from 12½ in. to about 11⅝ in., enabling the 12-in. shroud to be slipped over it easily.

When atmospheric air was allowed to re-enter the corrugated tube at the full sea-level pressure of 14.7 psi, an expansion took place, which brought the tube up to an OD of 11.770 in., the exact ID of the shroud.

With the tubes thus snugly joined, they are welded along the lines where each corrugation touches the outer shroud. To meet Convair specifications, indirect spot welding is used. This means that both electrodes are at the top of the work and the current passes from one electrode through a bottom bar and back up through the second electrode.

So far as Solar knows, the vacuum technique used in assembling the augmentor is unique, but it is a method that may find other applications in metalworking.

1—BILLBOARD for "sidewalk engineers" shows how Straits of Mackinac crossing appeared in cross-section. Pipes were pulled from left to right

2—ON SHORE, workmen of Midwestern Constructors welded pipe lengths into 16 sections of 2,500 ft each to make up the two four-mile crossings

Toughest Pipeline

Some of the things that made it tough were: 47 railroads, 46 highways, 45 river crossings, 100 miles of swampland, 140 miles of heavy forests and, topping it all, a four-mile crossing of the Straits of Mackinac.

BY T. B. JEFFERSON

NEARING completion as this is written, the 643-mile Lakehead pipeline from Superior, Wis., to Sarnia, Ontario, was finished at a total cost of $75,000,000. This pipeline ties into the 1,130-mile Interprovincial pipeline, which carries crude oil from the Edmonton, Alberta, area to the head of the Great Lakes. The new addition will take 2,800,000 barrels of oil to fill it—more than $6,000,000 worth of oil.

Running across the scenic upper peninsular country of Michigan, the Lakehead line begins at Superior, on Lake Superior opposite Duluth, and ends eight miles inside Canada at a point about 50 miles northeast of Detroit. The job of building it was so huge that it was split up among ten contractors (see Table I). The pipeline contracts themselves were held by six different contractors, while three other firms were allotted the two biggest river jobs and the colos-

3—ACCURATELY beveled edges for welding are cut. Torch goes all the way around 20-in. pipe

4—HERE are the racks where various random lengths of pipe were welded to make up each 2,500-ft section

5—WELDED 2,500-ft sections of line were coated with tar and protected with lagging before launching

Table I. Pipeline Contractors

Location	Miles	Location	Miles
Superior—Ironwood (Mahoney Contracting Corp., Lansing, Mich.)	91	Red Oak—Bay City (Conyes Construction Corp., San Pablo, Calif.)	87
Ironwood—Crystal Falls (Anderson Bros. Corp., Houston, Tex.)	100	Saginaw River (W. J. Meagher & Sons, Inc., Bay City, Mich.)	0.5
Crystal Falls—Cooks (Anderson Bros. Corp., Houston, Tex.)	93	Bay City—Port Huron (Conyes Construction Corp., San Pablo, Calif.)	88
Cooks—St. Ignace (Midwestern Constructors, Inc., Tulsa, Okla.)	93	St. Clair River (Midwestern Constructors, Inc., Tulsa, Okla.)	0.5
Mackinac Straits (Merritt-Chapman and Scott Corp., Cleveland)	4	Port Huron—Sarnia (F. E. Shaw, Ltd., Sarnia, Ont., Canada)	8
Mackinaw City—Red Oak (Bechtel Corp., Pipeline Div., San Francisco)	78	Superior Pumping Station (Walco Engineering and Const. Co., Tulsa, Okla.)	

sal task of crossing the Straits of Mackinac. The tenth contractor installed the pumping station at Superior.

What Made It Tough

All of the line except for one important part was of 30-in. welded steel pipe, representing some 153,000 tons of steel. The single exception was at the Straits of Mackinac, on the bottom of which two 20-in. pipelines were laid. These presented the toughest problem of all since four miles of water ranging in depth down to 243 ft had to be crossed.

Other obstacles were man-made. There were 47 railroads, 46 state and federal highways, 75 county roads and many local roads that had to be crossed. Nature took a hand by scattering 45 rivers in the way of the pipeline, four of which are navigable. The Saginaw and St. Clair rivers presented problems so special that separate contractors had to be employed for each crossing (Table I).

The terrain is also difficult—a declaration that the boys who worked on this line will probably consider a masterpiece of understatement. The right-of-way passes through 100 miles of swampland (see front cover) and 140 miles of heavy forest. Because of the cold winters of northern Michigan, all of the pipe was ditched to provide a minimum coverage of three feet of earth. Here, again, nature played mean tricks. Over 10% of the ditch excavation was in rock, 55% in sand and gravel, 15% in sandy loam, 15% in clay and 4% in clay and boulders. About 1% of the line runs through water.

Land Part of Line

The 638 miles of the line that run over land were divided into eight spreads, ranging in length from 8 to 100 miles. The 630 miles of line in the United States were built by five contractors, who were awarded seven contracts (two contractors had two spreads each). The eight miles into Canada, from Port Huron to Sarnia, were built by a Canadian contractor. The names of the various contractors are given in Table I.

The many difficulties encountered in the land part of the pipeline had little influence upon the welding procedure, which was similar to those used on other pipelines. The 30-in. pipe sections were prepared for a single-vee butt weld with a 1/16-in. root and welded in four passes: a root pass, hot pass, filler and cap pass. This procedure was followed throughout the length of the line. Welding was done in three positions: downhand, vertical and overhead.

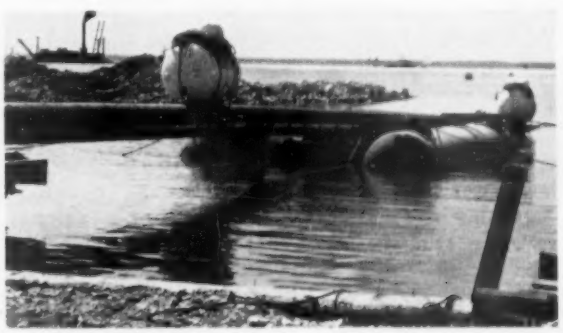
The thickness of the pipe varied from 9/32 to 3/8 in. At the Saginaw and St. Clair river crossings, pipe of 1/2-in. wall thickness was used and was encased in concrete.

Mackinac Crossing

The most spectacular job ever undertaken in pipeline construction was to lay the twin lines (western and eastern) across the Straits of Mackinac. These lines were spaced 1,300 ft apart. Offshore, they were laid in a trench, which provided a minimum coverage of 15 ft of earth, and trenching was continued until a depth of 65 ft below the water level was reached. From the 65-ft level on, the pipe was allowed to lie directly on the bed of the straits. At its deepest point it was 243 ft below the surface of the water.

The western line was trenched and

6—ROLLAWAY carriages, each consisting of two clusters of rubber-tired wheels, speeded up the launching



7—PONTOONS were lashed to the pipe every 65 feet to keep it from sinking and ease the task of pulling

buried for about 7,500 ft, the eastern line for about 8,300 ft, of the 20,000-ft crossing.

Sidewalk Engineer's Bulletin

Photo 1,* an animated billboard for sidewalk engineers (who watched the job from a specially built grandstand), shows how one of these lines across the straits appears in cross-section. The 2,500-ft welded pipe sections were strung out on the north shore (left of photo) and pulled by a huge winch to the south shore.

The two 20-in. underwater lines extended from Point LaBarbe, about four miles west of St. Ignace on the north shore, to Point McGulpin, to the west of Mackinaw City, on the south shore. This is the narrowest portion of the straits.

The pipe used for the crossing is a special open-hearth grade A steel seamless tubing, of 20-in. OD and 13/16-in. wall thickness, weighing 166 lb per ft. It was required to withstand a hydrostatic pressure of 1,500 psi for a maximum operating pressure of 600 psi.

Sixteen sections 2,500 ft long were welded for the two underwater crossings. The pipes were received in random lengths, averaging about 27 ft, and some 92 different lengths had to be handled for each section. In order to minimize handling of the long welded sections, all welding was done near the launching areas. This necessitated the clearing away of the forest from two strips along the north shoreline (photo 2), one for the western and one for the eastern pipeline. Each of the welding strips was approximately 1,000 ft wide and extended back about 3,000 ft from the shore.

Some Welding Details

Pipe ends were flame-beveled by machine (photo 3) for a 75-deg, full-depth vee. In contrast to the land welding, eight passes were made per joint: a root pass, two hot passes, four fillers and a finishing cap weld.

The 2,500-ft sections were assembled and welded on racks (photo 4), which paralleled a series of rollaway launching carriages. Every weld was X-rayed. There were no exceptions since it was necessary to insure 100% perfect joints. After X-raying, the long sections were cleaned, coated and wrapped.

*Photos 1, 2 and 7 courtesy Detroit Diesel Engine Div., General Motors Corp.

8—ON LAND parts of line, truck-mounted welders were used to make the root beads. As much as 7,020 feet of pipeline were welded in a single day

Side-boom tractors held the pipe clear of its supporting rack while the cleaning and coating were being done. First, a special self-propelled machine running on top of the pipe cleaned it and applied a prime coating of a coal-tar-base protective material. Then another machine, likewise self-propelled, followed along the top of the pipe to apply a coal-tar-base enamel and two spiral wrappings of glass fiber matting. The pipe was enameled and wrapped in a single operation. It was then banded with 1 by 3 in. soft-timber lagging to protect it during installation.

Ready now to leave its assembly cradle, the 2,500-ft length was moved by the side-boom tractors onto the nearby and parallel line of rollaway launching carriages. Each carriage consisted of two clusters of three rubber-tired wheels (photo 6). In order to insure that the weight was equalized, the wheel clusters were mounted on a welded steel frame, which was pivoted in the center of a fixed steel frame. The three wheels in each cluster had 10-ply 6 by 9 rubber tires for the pipe to roll on as it was launched.

In all, 60 such carriages, spaced at 45-ft intervals, were required to get a 2,500-ft section into the water.

Problems of Launching

The real test of weld quality came with the launching and when the sections were being pulled across the straits. Even though the north shore slopes gently to the water line, a special launching device was used to minimize bending stresses in the pipe. This device bears the long name "hydropneumatic multidifferential self-stabilizing pipe launcher" and was originated by the Collins Construction Co., Victoria, Texas, for launching pipelines in water subjected to tidal variations. It provides six articulated points of support.

Before the launching could begin, however, it was necessary to weld a bull plug with an eye in its center at the head end of the first section. The eye was for towing. The weld had to be good since it would be subjected to the full weight of the entire 20,000 ft (3,320,000 lb) before the line was finally in place.

The 20,000 ft of pipe were pulled across the straits by means of multiple 2,500-ft lengths of 2-in. wire rope attached to a 210-ton, double-drum winch on the south shore. To keep the submerged length from being pulled too far into the water, a 50-ton winch on the north shore acted as a brake and kept the pipe under tension.

Pipe on Pontoons

To prevent the pipe from sinking immediately to the bottom, buoys were lashed on top of it at regular intervals (photo 7). These pontoons were steel cylinders 58 in. long and 38 in. in diameter. They were spaced along the pipe section at 65-ft intervals. The pontoons were cleverly arranged so that they would become self-releasing after the entire line had

(Continued on page 70)

SUCCESS of a production resistance-welding installation depends upon ignitron tubes to switch the heavy currents

New Ignitrons Have Thermostat Control

Water-cooled ignitrons are now protected by built-in thermostats against harmful rises in temperature. Some engineers say that this is the most important advance in ignitron control to be made in more than ten years.

BY JOHN H. HUTCHINGS
Vice-president, National Electronics, Inc., Geneva, Ill.

OPENING at lower right of new size C ignitron provides access to a thermostat. See next page for comparison with old tube design

THOSE big mercury-pool tubes that switch the heavy currents needed for resistance welding have to be cooled by flowing water. If the temperature is allowed to reach limits set by the tube manufacturer, the results are likely to be arc-back, faulty operation and short tube life. But safety devices can sometimes do their job too well.

INTERRUPTIONS TO SERVICE

Users of water-cooled ignitron tubes have long sought a means of protection that would not introduce unnecessary shutdowns. In most cases, interruptions to service have been due to transient fluctuations in water pressure or to mechanical failure of the flow switches. Water flow can stop completely for short periods if the ignitrons are heavily loaded, or for periods of several minutes under light load, without damaging the tubes. The old system of tube protection failed to take advantage of this fact.

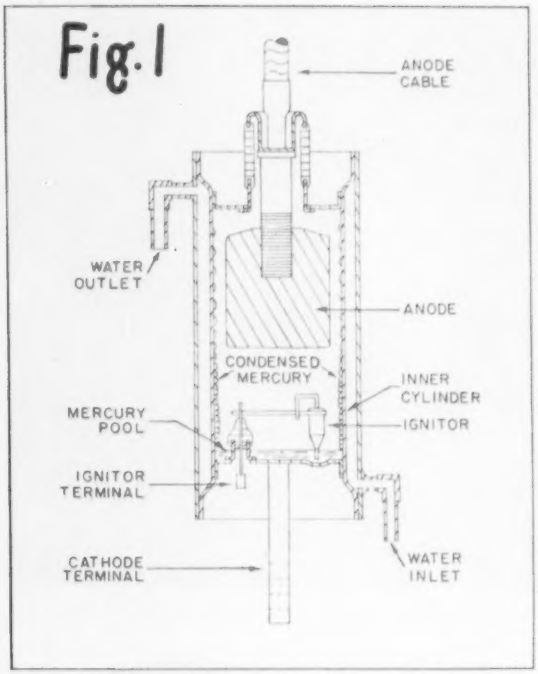
The new system described in this article provides ignitron-tube protection but eliminates all unnecessary interruptions. Working entirely on tube temperature, it is very much like the thermal protection built into motors. It shuts the control down when, but only when, the tube temperature has risen to a point that actually endangers ignitron life.

Furthermore, this system permits substantial water saving. A suitable thermostat is mounted on the tube to control a solenoid-operated water valve. With such an arrangement, the water flows only when the tube becomes warm enough to require cooling.

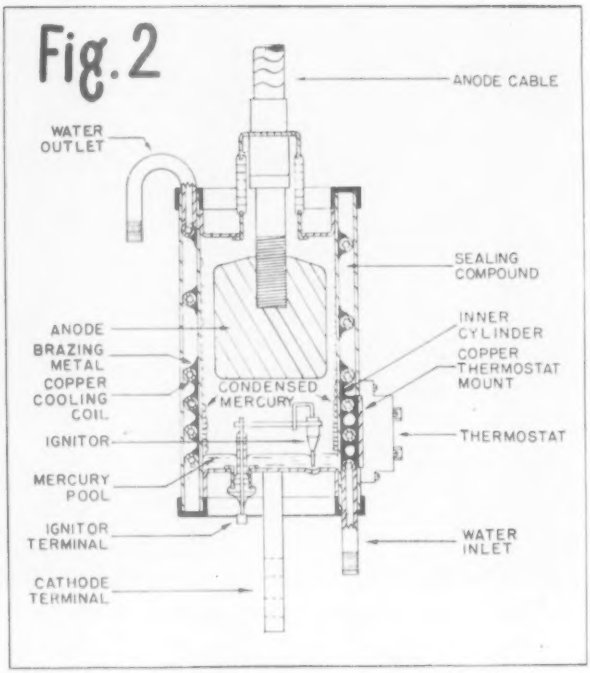
OLD AND NEW DESIGNS

The heart of this development is a new ignitron tube providing access to the inner cylinder. Successful operation of ignitron tubes depends upon maintenance of proper mercury pressure. In this tube, it is the temperature of the inner cylinder that controls the mercury pressure. The most important factor determining mercury pressure is the temperature of the inner cylinder in the region of the discharge, which occurs between the mercury pool and graphite anode.

Turn now to the next page.



1—OLD size C ignitron tube has an outer jacket to hold water. It is obvious from this drawing that the inner cylinder of the tube is not available to use for the mounting of a control thermostat



2—NEW size C ignitron replaces the water jacket with a brazed-on copper cooling coil. This enables the inner cylinder and cooling coil to be exposed for the purpose of mounting a thermostatic control

Figure 1 diagrams the conventional stainless-steel ignitron construction that has been used for the past seventeen years. It is apparent that the inner cylinder in the lower half of the tube is surrounded by water and by the water jacket. Hence it is not available for external mounting of a control thermostat. Various attempts have been made to install thermostats through the outer wall or to install thermostats on the water jacket, but all of these methods have proved unsuccessful.

Figure 2 diagrams the new ignitron. It is similar internally, but the water jacket has been replaced by a brazed-on copper cooling coil. This design was originally adopted because of the improved cooling obtainable with turbulent water flow. Study of this sketch reveals that the external cylinder has become simply a decorative covering. Hence an opening can be made in it, through which the inner cylinder and the cooling coil are exposed for thermostatic control.

In the construction actually used in producing the NL-1052 size C ignitron, the copper cooling coil is heavily brazed to the steel cylinder that contains the mercury. A copper thermostat mount is also brazed to this system. The thermostat mount is at essentially the same temperature as the cooling coil and inner cylinder; therefore, it responds to temperature changes of the inner cylinder and so may be used for thermal control of the cooling system.

The thermostats mounted on the new-type ignitrons are the Klixon C-5880 series of thermostats, which have been used for many years in thermal-type flow switches built into resistance-welding control panels. Applications made to date may be divided generally into two classes:

1. To Limit Shutdowns

The simplest system is for the user who wishes to avoid unnecessary shutdowns due to water-pressure fluctuations or flow-switch failure. A shutdown is wanted only when the water has failed for a sufficiently long period to allow an excessive inner-cylinder temperature that endangers ignitrons' life. To meet this limiting requirement, a normally closed thermostat, such as C-5880-2 or -10, is mounted on one tube, and the two sets of contacts are connected to the control circuit or in series with the two ignitors. Figure 3 pictures the arrangement. In many cases, a C-5880-2 thermostat is now installed in the existing welding control panel as part of the thermal flow switch. This can simply be transferred to the mount provided on the ignitron tube.

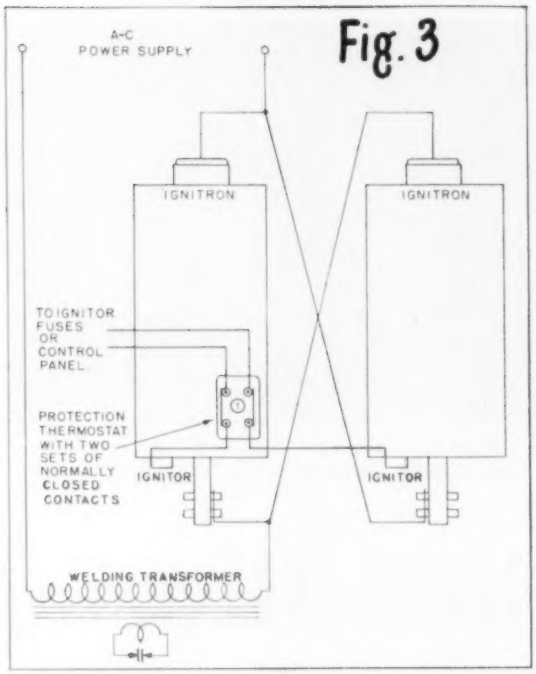
A modification of this system seeks to save a large part of the water flow normally required by ignitron tubes. Consider an installation in a production line where the welding machine is used rather steadily but where the load, considered over a period of a minute or two, is well below the full rating of the tube. This may be because of idle periods of many seconds, or even minutes, which are needed to remove the welded assembly and install the new parts to be

Table I. Maximum Temperatures

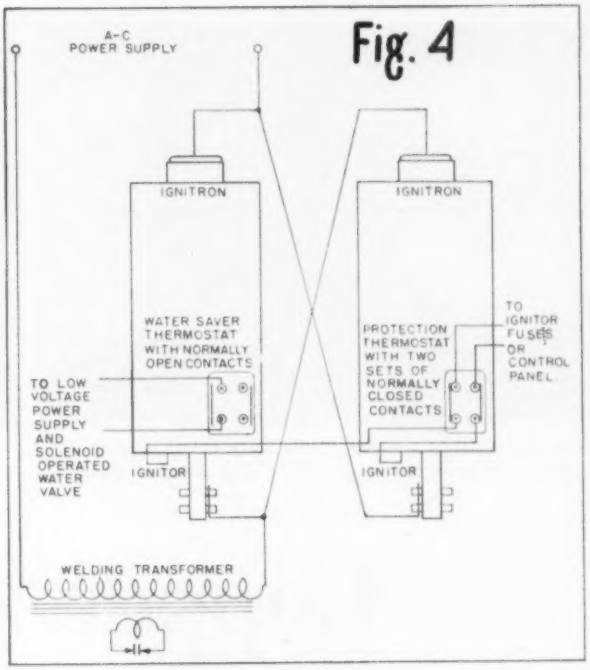
(NL-1052 Size C Ignitron Ratings)

At 600 volts rms	113 F
At 500 volts rms	122 F
At 250 volts rms	131 F

Cooling-system temperatures are all measured at the thermostat mount.



3—CONTROL system here is intended primarily to avoid unnecessary shutdowns. Normally closed thermostat is mounted on one tube, and the two sets of contacts are connected to the control circuit



4—THIS system provides an automatic control of water flow. Normally open thermostat is mounted on one ignitron tube of control panel and a normally closed thermostat on the other. The text tells how it operates

welded. In such cases as this, it is entirely practicable to reduce the flow of water through the control valve. If the reduced flow of water does not increase the cooling-system temperature above the rated value, it will not endanger the tube in any way. A reduced flow may be expected to result in water savings of from 50 to 90% in typical installations. Refer to Table I for cooling-system temperature ratings.

2. Automatic Flow Control

The second use that has been made of the new thermostatically protected ignitron tube is the automatic control of water flow. This system provides maximum water saving and is particularly adaptable to resistance welders that are not used continuously.

An arrangement is sketched in Fig. 4. A normally open thermostat is mounted on one of the tubes in the welding control panel, and its contacts are connected to a power supply and to a solenoid-operated water valve. The thermostat calls for water whenever the tube temperature has increased to the point where cooling is required. As soon as the flow of water has reduced tube temperature to a safe level, however, the thermostat opens the circuit and water flow is stopped.

Some protection is still required against the possibility of complete failure of the water supply. This is provided by mounting a normally closed thermostat on the other ignitron in the control. The contacts of this second thermostat are used to open the ignitor circuits in the event tube temperatures reach dangerous levels.

Water savings as high as 96% have been reported with this automatic arrangement. See Table II for applications details of a typical 460-volt installation in Dayton, O., utilizing a thermostatically controlled water valve.

It is the conclusion of those who are using the systems described above that this new type ignitron provides the answer where: (a) water saving is desired or (b) where unnecessary shutdowns due to a poor water supply are to be avoided.

Table II. Water Savings with Thermostatically Controlled Water Valve

Job Description	Cycles on	Spots per hr	Duty	Amperes (rms demand)	Water Use, gal in 8 hr		% of Water Saved
					Now	Previously	
150-kva spot welder used for brazing operation	14	440	3%	800	60	1,200	95%
150-kva seam welder welding 0.032-in. aluminum channel to plate	1 on 12 off	almost continuous	6%	1,000	44	1,200	96%

1—HAROLD BOUCHER (standing) heads department (precision mechanical assembly) that does the brazing

2—LARGEST of the three radiofrequency brazing machines, a 20-kw unit, has two bell jars for the work

Copper-Gold Brazing

Measuring instruments are the eyes and ears of science. With precision instruments, you have to take extraordinary precautions in order to make precision joints.

BY FRED M. BURT

INDUCTION brazing done inside a bell jar to provide a controlled atmosphere is the process relied upon to produce precision electronic instruments at Consolidated Engineering Corp., Pasadena, Calif. The brazed components range in size from merely small to very small and on down to tiny. Brazing is not a large operation at Consolidated's new 70,000 sq ft plant, but it would be impossible to carry on production without it.

The operations with which this article is concerned all take place in the precision mechanical assembly department, which makes such things as ionization chambers and other small precision assemblies. This department is under the general supervision of Harold L. Boucher (the gentleman standing in photo 1). Leadman D. Tilley is in charge of radiofrequency and radiation brazing. Besides high-frequency equipment, this department also has three quite small spot welders, with electrodes from darning-needle size up to 5/16 in.

There are three radiofrequency induction heaters: (1) A one-kw unit with one Pyrex bell jar and phase-shift control; (2) a 5-kw unit with two bell jars and (3) a 20-kw heater, also with two jars.

The largest of these machines is shown in photo 2. The operator is placing the part, a cold-cathode gage, on the work support at the right while another such assembly is being brazed inside the work coil under the bell jar on the left. At the right of the high-frequency machine are cylinders of hydrogen, from which piping runs to a drying tower at the rear.

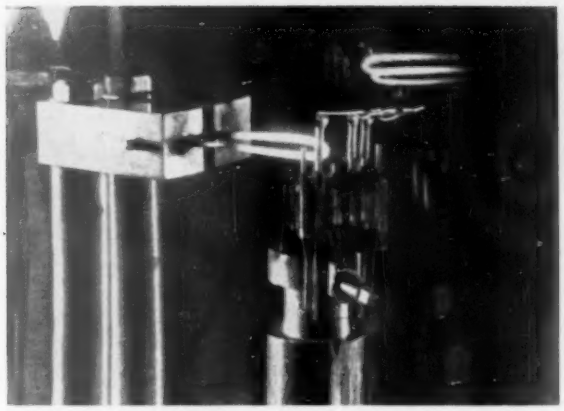
The hydrogen is delivered in standard 220 cu ft cylinders. As received, it is contaminated only by 0.4% of free oxygen and water vapor. But 99.6% pure hydrogen is not pure enough. Hence the hydrogen from the cylinders is sent to the drying tower, where a palladium catalyst causes the small amount of free oxygen to react with hydrogen to form additional water vapor. All of the water vapor is then removed by drying, leaving only pure, dry hydrogen to be piped to the bell jars.

Most of the brazing is done with copper or copper-gold alloys, applied as preformed rings. No fluxing of the parts is needed. Heat from the work coil is close to 2,000 F for copper brazing and about 1,800 F for copper-gold brazing. If desired, brazed parts can be quickly disassembled by dropping them into a 50-50 solution of nitric acid and water.

Brazing or soldering with the two radiation units is also done in a dry hydrogen atmosphere inside Pyrex bell jars. Photos 3 and 4 illustrate the process. The part on the work support is a filament assembly for a mass spectrometer; three leads are being silver brazed to tungsten pins. A loop of tungsten supplies the radiation heat. This tungsten wire is heated to incandescence inside a hydrogen atmosphere. It is not difficult to imagine what would happen if any traces of oxygen had been permitted to remain in the hydrogen.

Metal surfaces to be joined are cleaned by giving them a solvent dip. For some of the smallest items, an ultrasonic treatment is used to increase the efficiency of the solvent cleaner (benzene or ether). This is said to be a perfect method of removing grease from the smallest apertures, such as the smallest of tapped holes, to a depth up to ¼ in.

Consolidated Engineering Corporation's "analytical instruments for science and industry" are for use in chemical analysis and for detecting and recording vibration. They in-



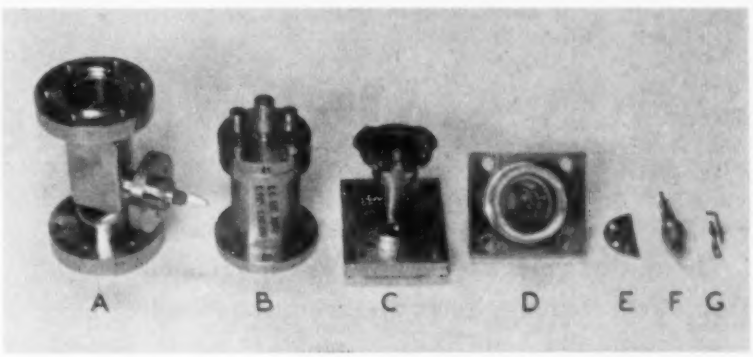
3—ANOTHER method of brazing is to use the heat radiating from a loop of incandescent tungsten wire

4—RADIATION brazing is also done under glass. The bell jar contains an atmosphere of pure, dry hydrogen

Done under Glass

clude such pieces of equipment as: analytical mass spectrometers (used extensively by petroleum and chemical industries for rapid analyses of gases and liquids), isotope-ratio mass spectrometers (highly important in cancer and other biological research); leak detectors for tracing minute leaks in either vacuum or pressure systems; the "Titrolog" for control of odorization of natural gas and the study of air pollution; an electrical computer that solves as many as twelve simultaneous linear equations; the "Spectro-Sadic" for high-speed tabulation of mass-spectrometer data; the "Micranometer" for precise pressure measurements of gases; the tiny "Gamatek," an instrument to indicate radioactivity; and recording oscillographs for the dynamic measurement of the most delicate vibrations.

ANALYTICAL mass spectrometer is a Consolidated Engineering product



SOME PARTS that have been brazed in an atmosphere of dry hydrogen. A: a "Diatron" envelope for a leak detector; B: a leak detector discharge gate; C: a collector housing; D: a glass vacuum seal; E: half section of a part of an ionization chamber for a mass spectrometer; F: a removable insulator brazed to a nut; G: a filament for a leak detector.

A: Diatron envelope has upper and lower flanges, body, side tube and collar—all parts being made of stainless steel. Upper and lower flanges are separately brazed to the body, using copper rings. Side tube and collar are brazed on with a 50-50 copper-gold alloy.

B: Stainless-steel leak detector discharge gate requires two butt-joint brazing operations. For each operation, a copper ring is placed in the machined flange before the oblong body is inserted.

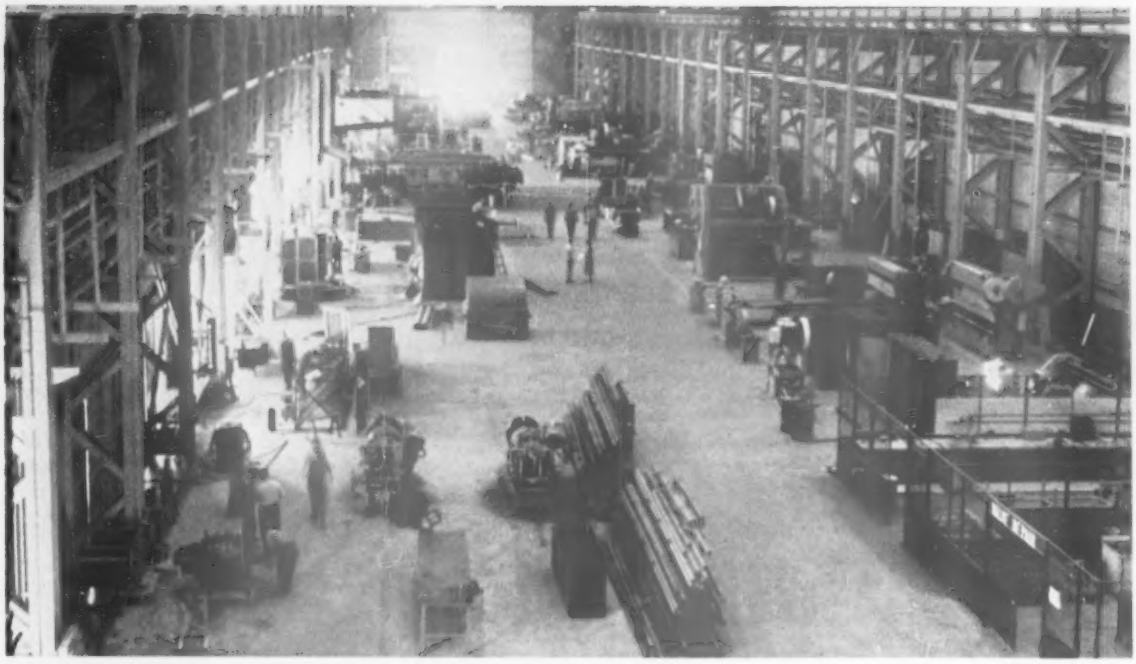
C: Stainless-steel collector housing has three parts brazed together. One brazing operation (visible) uses copper and two (out of sight) use copper-gold alloy.

D: Glass vacuum seal necessitates the brazing of stainless steel to Kovar, a cobalt-nickel-iron alloy. Copper-gold alloy is used.

E: Half section for mass spectrometer ionization chamber shows two molybdenum ferrules brazed with copper-gold to a nichrome disc.

F: Removable insulator is brazed to a stainless-steel nut. The insulation passes through the nut, and copper-gold brazing is done at the lower end of the nut and inside the body of Kovar.

G: Lower component is a nichrome lead formed by making two spot welds on a small welder. The electrodes were as small and sharp as darning needles. Nichrome end is soldered to a tungsten pin (upper component) with radiation heat in a dry hydrogen atmosphere. A silver-copper-tin alloy is used.



WELDING SHOP, one of three buildings of Fairless central maintenance shops, covers a floor space of 11,500 sq ft

Maintenance Is Big

New, completely integrated steel plant on the Delaware River needs 50 weldors and seven apprentices to keep things running. There are five mobile welding units.

BY HERMAN C. PHELPS

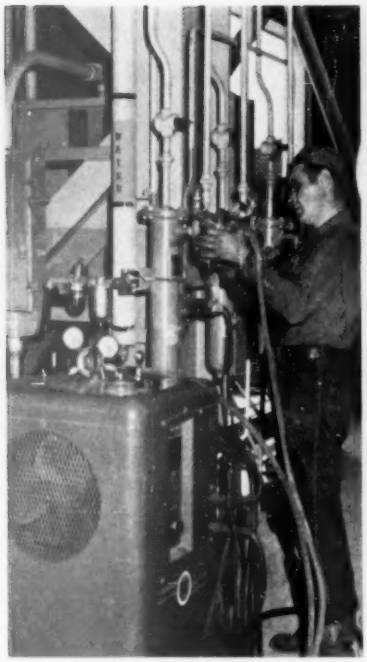
WELDORS at the new central maintenance shops at Morrisville, Pa., are often required to work in very awkward places. They may be aboard ore boats, on ore loaders or Diesel locomotives, atop bridges or cranes, in open-hearth furnaces, blast furnaces or skip houses, up power company transmission lines or engaged with conduit brackets, switch boxes, etc. It's all in the day's work at these maintenance shops, which constitute an important part of the giant new Fairless Works of U.S. Steel Corp.

Located on the Delaware River, where it is able to receive ore shipments from as far away as Labrador and South America, the new Fairless Works went into production in December, 1952, with an initial program of two batteries of 87 coke ovens each, two 28-ft blast furnaces and nine open hearths. A fully integrated steel mill, it has an annual capacity of 1,800,000 tons of steel ingots, 1,200,000 tons of pig iron, 289,000 tons of cold-rolled sheets, 235,000 tons of hot-rolled sheets, 285,000 tons of bar products and 170,000 tons of tin mill products. In addition, 281,000 tons of pipe can be produced at this site annually by the National Tube Co., U. S. Steel pipe-making subsidiary. The whole works is named in honor of Benjamin F. Fairless, board chairman and chief executive officer of U. S. Steel.

Just how important welding has become to the steel industry is well exemplified by the amount of space, equipment and personnel devoted to it at Fairless. Of three huge adjoining buildings for maintenance, the one used almost exclusively for welding covers 11,500 sq ft of floor space. Even so, the space assigned to the welding shop is already proving to be too small. At present there are 50 weldors and seven apprentices, but this figure will soon be increased to a total of 65.

The maintenance department has all the newest types of equipment for oxyacetylene, metal-arc, inert-gas, submerged-melt, thermit and resistance welding as well as equipment for oxyacetylene and arc-air cutting. Five mobile welding units are busy every minute of the day. For metal-arc welding alone, there are 55 motor-generator and rectifier weldors, of 300 to 600 amp capacities.

There are 42 oxygen and acetylene outlets, spaced at intervals for easy accessibility around the welding shop, boiler shop and machine shop. There are similar outlets for arc welding. These conveniently located outlets make it possible to reduce the length of cable leads to 75 ft and of oxygen and acetylene hoses to 50 ft. At no time is welding hose or lead cable allowed to cross over the center aisles, which are kept clear for trucks and a walkway.



ATTACHING a regulator to one of the 42 oxyacetylene stations

ELLWOOD Filsbury, operator of a mobile welding unit, gets his last-minute instructions from Andy Urish, foreman of welding and rigger shop

Business at Fairless

Weldors work around the clock. The three shifts are from 7 a.m. to 3:30 p.m., 3:00 p.m. to 11:30 p.m. and 11:00 p.m. to 7:30 a.m. Some weldors start their work week on Saturday and continue through Wednesday. Others start on Monday and end on Friday. Thus a crew is on hand every hour, every day of the week.

A central repair station keeps oxyacetylene regulators in good order. This department is in a separate enclosure at one end of the building. All regulators used in the shop have been standardized on one particular make or brand. This increases efficiency and speeds repairs.

All Weldors Qualified

Every one hired must be a combination arc and oxyacetylene weldor. Every weldor must pass a standard test to qualify for a position. After a man is hired, he is under close observation for a period of 260 hours. At the end of this period, he is reclassified to either intermediate or standard rating.

When a weldor has passed his tests, he is assigned the job of fabricating items such as special-size cabinets used for tool storage, etc. The weldor cuts out the sections according to blueprints, jigs them and then welds the parts into a complete unit. This shop trial enables supervisors to evaluate the ability of every man in the department. However, welding methods do change and when better ones and materials are developed, they are immediately considered.

All methods, procedures and processes used are defined by the supervisors. This includes such things as preheating and stress relieving. Preheating is normally at 150 F on 4-in. material and graduates to 350 F on 14-in. plate.

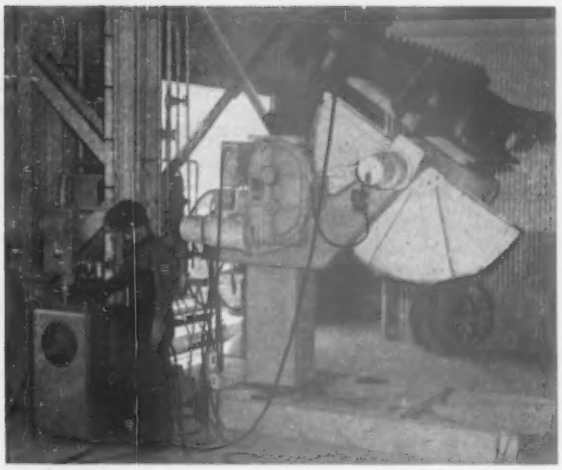
A weldor must be able to weld all metals. He may be called on to weld carbon-moly or chrome-moly steel pipe in the boiler house area and the next day be required to apply hardfacing rods to clamshell bucket teeth.

About 70% of the welding is done by the arc method, including the submerged-melt and inert-gas processes. Most of the balance is done by the oxyacetylene torch.

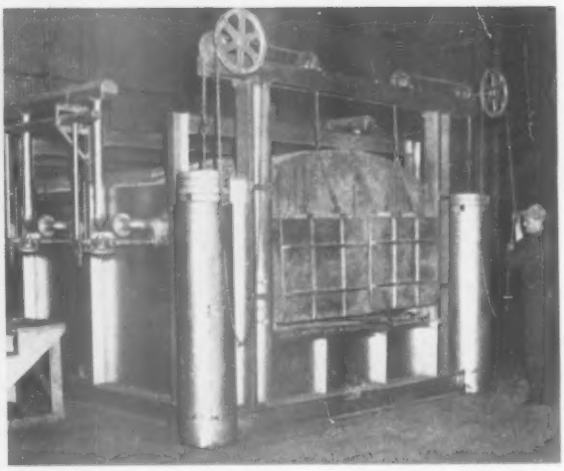
Maintenance problems occur everywhere in the vast expanse of the Fairless Works. Even though nearly everything is new, break-downs occur hourly. They must receive prompt attention. As one example of where maintenance may be needed, consider the hot-strip mill, housed in a building a mile and a quarter long. An endless ribbon of red-hot steel sheet flys through it at speeds up to 35 miles per hour. A spot like this is where good maintenance can be fully appreciated.

Each operating division of Fairless Works is assigned weldors and flame-cutters to work with their "bull gangs" or spot repair crews. They work directly under the supervision and jurisdiction of the divisions. The central welding department acts as a unit of the maintenance division.

The central welding shop furnishes welding and cutting service to every shop. It also makes welded fabrication and does all hardfacing and build-up of worn parts for the whole works. The weld shop supplements the operating divisions with weldors and cutters on downturns, general re-



POSITIONER with a capacity of 10,000 lb is being used by Weldor Leonard Teeny in a job of fabrication



BIG weldments are preheated at up to 350 F in this oil-fired furnace. Furnace also does stress relieving

pairs, rebuilding and new construction. Besides all this it must carry a standby crew for any emergency in a 24-hour period.

Each of the five mobile units is fully equipped with a 300-amp welding generator and a set of oxygen and acetylene cylinders. The generator has an oversize exciter to provide 110-volt current for grinders and extension lights.

At times these mobile units have been called upon to do as many as four different jobs in a day, working in remote and sometimes almost inaccessible areas. They help eliminate transport and temporary electrical hook-ups. However, when welding must be done on heavy equipment or on jobs of lengthy duration, motor-generator sets are brought into play.

Maintenance Starts at Home

An auto mechanic is assigned to check all of the mobile welders on the graveyard shift, at which time the need for them is at its lowest probability. He cleans, lubricates, checks oil and water and fills them up with gasoline. He also overhauls engines and transmissions, repairs tires, does everything necessary to keep each unit in constant readiness. Such preventive maintenance pays off in the absence of failures during the period of service.

All motor-generator sets are checked by an inspector, who takes care of as many as possible each day. He checks their operation, lubricates them if required and passes judgment as to whether a set should be overhauled in the shop or sent outside.

Automatic Build-ups

Recently the weld shop was equipped with a giant lathe, which is used for automatic welding and build-up applications with a submerged-arc head. The welding head, wire reel and flux-recovery equipment are mounted on a frame connected to the lathe screw for cross travel. This enables deposited metal to be applied helically.

Weldments are fast replacing castings in many instances or are supplementing castings to simplify coring, pattern making, molding and pouring requirements. When welding is used, casting designs need not be followed too closely. More often consideration need be only given to required centers, clearances and spacings.

With this thought in mind, engineers design new parts so they can be fabricated from rolled steel products such as plate, structural shapes, bars and pipe stock. The thought always in mind is to reduce machining operations.

A good example of welded fabrication is in the making of charging boxes. In a plant the size of Fairless, thousands of these boxes are used daily to carry new materials and scrap to open-hearth furnaces. The welding department has a standing order to fabricate them by welding and to keep a good supply on hand.

A charging box includes two castings: an end casting and a "peel head" casting with a rectangular pocket. The peel head casting connects to the peel head of a charging machine shaft. This shaft lifts the box from a buggy and turns it over to empty it inside the furnace. In the upside-down position, it is pulled back and forth over the burden in the furnace to level the charge, which means that it sees plenty of rough usage.

The sides, bottom and rim are made of three plates and two bars. These are cut on a shape-cutting machine from large plate. With the cutting done by machine, parallel edges are obtained with shapes of nearly exact length and width. This helps eliminate poor fit-up and resultant loss of flux. These parts are assembled on a big jig ready for the submerged-arc welding process. After welding, the box is placed in the annealing furnace for heat treatment and stress relieving.

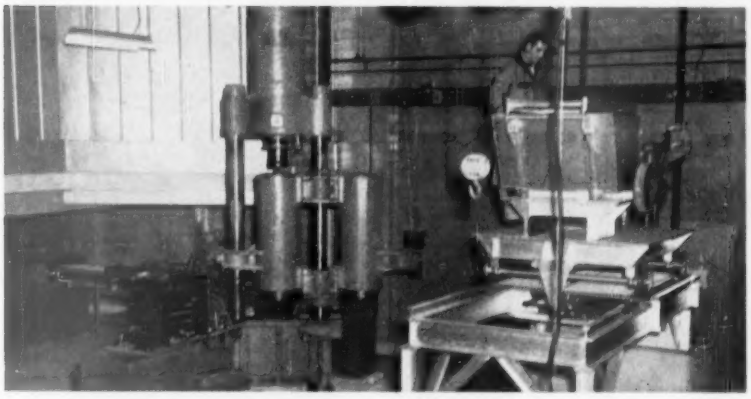
Only special items not available on the open market or equipment needed in a rush is fabricated in the shop. Nearly all welding is strictly for maintenance.

Most rods used are large diameter. U. S. Steel buys 9,000 lb of all brands of electrodes a month for this plant. About 60% of them are ¼-in. diameter. The 5/32-in. size is next in popularity.

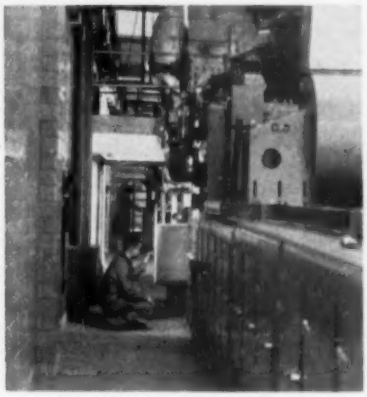
Thomas C. Pratt is superintendent of the central maintenance shops. E. J. Manley is assistant superintendent. Other key men are: C. A. Kerr, general foreman of the structural shop; A. E. Urish, assistant general foreman of welding and rigger, and Pat F. Flaherty, welding shop foreman.

1—HE WEIGHS raw ingredients

2—LAZY SUSAN turntable facilitates the handling of dry coating materials



3—OPERATOR in background feeds slug press. Extrusion press is at left



4—BAKING oven is 150 ft long

Trip through an Electrode Plant

CLEANLINESS is a prime requisite for the manufacture of welding electrodes. Dust, dirt or other foreign particles can cause imperfections that will affect the performance of large batches of coated rods.

Walking through the new A. O. Smith Corp. plant, near Lancaster, Pa., a visitor sees at once how the problem of cleanliness was solved. The building's 41,000 sq ft of floor are vacuum cleaned every 24 hours. The walls are glazed tile. The plant has a system of air-pressure balance under which slightly more air is admitted than is exhausted. The internal pressure tends to force dust and dirt out of the building.

Meticulous weighing and measuring of materials going into the manufacture of electrode coatings is the indispensable beginning of the manufacturing process. In photo 1, a workman is weighing part of the dry mix. Instead of being calibrated, the scale is set with a terminal point for the weigh, reducing any possibility of the operator misreading. Each electrode batch has its own card on file, and each material going into the mix has a lot number, which simplifies the tracing of a defective lot.

Handling of the raw materials going into coating mixes is greatly expedited by the use of a novel merry-go-round or "Lazy Susan" turntable (photo 2). This puts at the operator's elbow all the materials that are needed in the dry mix.

From the blending hopper, coating materials are dumped into a rail cart and moved to the wet mix. The silicates that are used as binders for electrode coatings are piped to the wet-mixing operation from underground storage tanks. A constant temperature of 55 F is maintained by piping natural spring water around these tanks.

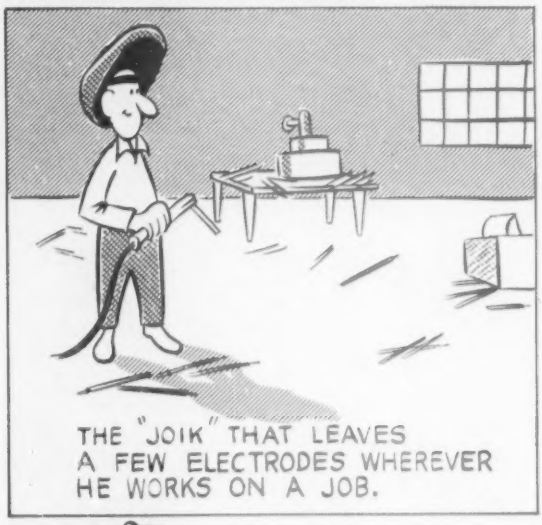
The hygroscopic coating materials that are necessary in the manufacture of low-hydrogen electrodes are stored in a special air-conditioned room. This is done so that there will be no variations in the amount of moisture in these critical coatings.

The operator in the background of photo 3 is feeding the slug press, which forms long, claylike molds from the wet mix. These slugs are then fed into the extrusion press (cylinders at left). The extrusion press forms the coating at the rate of 20 rods per second and then feeds the coated rods into the baking oven.

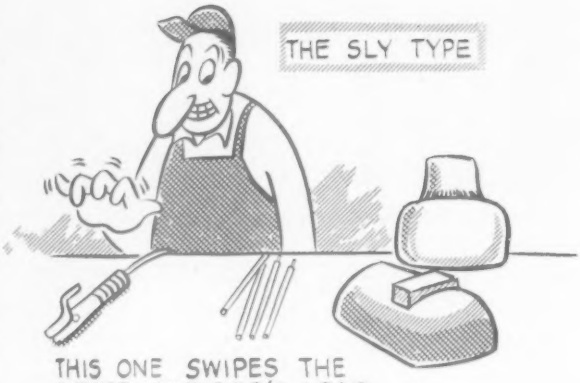
Perhaps the plant's outstanding feature is its new oven, which is 150 ft long. Divided into six control zones, the oven has a control system that regulates humidity, temperature and air distribution for each zone. Doors at floor level (photo 4) permit easy, frequent inspection of the electrodes during every part of the baking process. These doors make it possible to clear oven jams quickly.

A WELDOR'S WOES

THERE'S ONE IN EVERY SHOP...

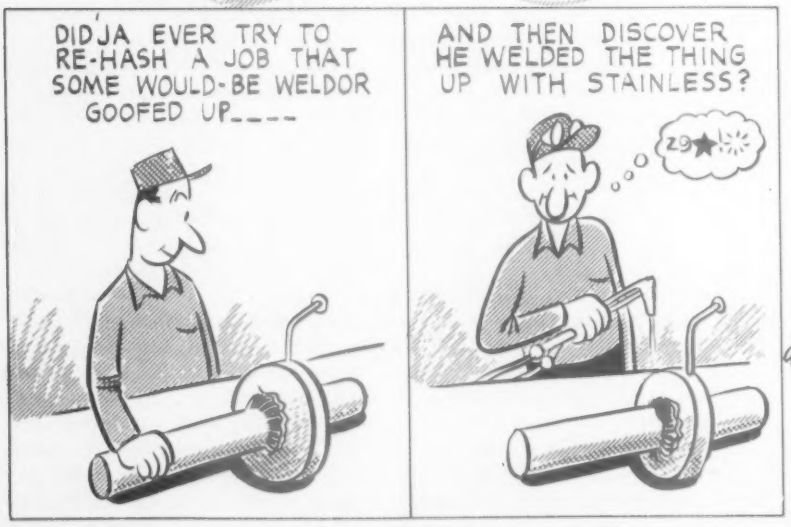


THE "JOIK" THAT LEAVES A FEW ELECTRODES WHEREVER HE WORKS ON A JOB.



THIS ONE SWIPES THE OTHER WELDOR'S LEAD. HE'S TOO BUSY (?) TO UNROLL HIS OWN.

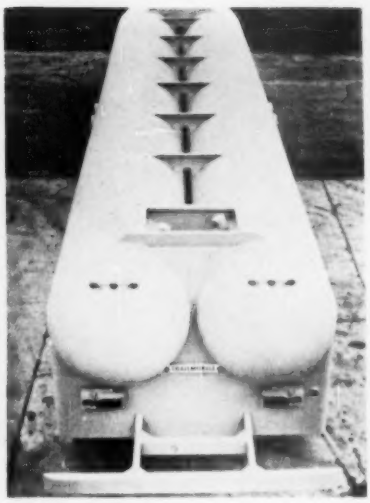
FRANK TABOR



"SHORT SAD STORY"

ONCE UPON A TIME, THERE WAS A WELDOR, WHO LIT A SMOKE WHILE HE WAS CHARGING THE ACETYLENE GENERATOR. THE END.

1—TWIN tank trailer to transport liquefied petroleum gases was a real job



2—TOP view shows safety valves

So You Have Code Troubles?

If you think that *you* have code troubles, try building twin tank trailers to haul liquefied petroleum gases. This is really a job of "restrictive" welding.

BY T. B. JEFFERSON

WHEN the job gets too tough for other fabrication methods to stand up, they weld it. That has been said many times in THE WELDING ENGINEER. Here is one more example:

The twin tank trailer pictured in photo 1 is a type commonly seen on our highways. Its job is the transportation of liquefied petroleum gases. Total tank capacity is 5,650 gallons. Trailer dimensions are: length 35 ft 7 in., height 8 ft 4¼ in., width 7 ft 11½ in. The tanks are pressure vessels fabricated from SA-212 steel. They are 30 in. in diameter, 7/16 in. in shell thickness and have hemispherical heads formed from ¼-in. plate.

From a fabricating standpoint, the job is tough. Furthermore, the restrictions imposed by various codes greatly added to the difficulties.

WHICH CODE TO USE

A trailer unit of this type must be fabricated according to the ASME Code for Unfired Pressure Vessels. Yes, but which year? The ASME Code was changed in 1950. Pressure vessels such as these trailer tanks are limited to an operating pressure of 200 psi when built under the 1949 code, whereas the 1950 code allows 250 psi. That's easy; use the 1950. It's not that simple. Some municipal and state regulatory bodies have not accepted the 1950 code. Then use the 1949. No, that won't do either; other regulatory bodies have adopted the 1950 code and would not approve a product fabricated under the 1949 code. The only solution was to design and build the vessels to meet *both* codes and stamp them with both 1949 and 1950 stampings.

Originally, this unit was designed under the 1949 ASME Code, paragraph U-69, which cites structural strength requirements for a pressure vessel used as a stationary unit. But an additional allowance in shell thickness had to be provided because the cargo tanks were used as stress members in a trailer unit, which is not stationary. The use of the tanks to substitute for a trailer frame is not only good designing but it is also a regulation in the Interstate Commerce Commission Specification MC-330, which covers pressure vessels that are designed for the transportation of liquefied petroleum gases.

MORE APPROVALS NEEDED

Wouldn't you think that meeting these various code requirements would be enough? Actually, it was only the starting point.

Before any fabrication could begin, the manufacturer, Trailmobile Incorporated, had to submit its calculations and blueprints to the Hartford Steam Boiler Inspection and Insurance Co. and to the Globe Indemnity Co. for consideration by their engineering departments. Since these authorities on unfired pressure vessels would supply inspection service, it was necessary to have their full approval of the calculations and prints. Finally this was secured, and Trailmobile went ahead.

By using automatic submerged-arc welding, turning rolls and special fixtures, the job of building the trailer unit was greatly simplified. On the longitudinal and girth seams of the tank shells, submerged-arc welding was done both inside and outside. The circumferential welding of the heads, however, had to be done from the outside only. The quality of the welds was checked by spot X-ray, in accordance with the ASME Code.

In addition to the many requirements imposed by the codes, Trailmobile built in some safety features of its own. Four safety relief valves

(Continued on page 75)

"WELD this broken door handle," the captain ordered. The job looked simple, but the part was a zinc-base die casting . . .

Ket Does a Magic Act

Meet Kettlehead the Great, the sorceror's apprentice. He hasn't learned how to pull a rabbit out of a hat yet, but he can sure make a broken door handle vanish.

BY CLEMENT HOWARD

MAINTENANCE of the motor pool was running along fairly smooth at the service base. However, good times don't last forever and when they do go to the devil, in many instances one individual is responsible. In this case, it was our boy Kettlehead.

For the Birds

Kettlehead was a civilian weldor, who had walked into the shop one day out of nowhere. His brag and bluster soon earned him the reputation of being "strictly for the birds." And the day after payday, he was sure to have the jumping jitters. Things might have been all right, though, if Kettlehead hadn't been the sort of overbearing guy who never overlooks it when a fellow worker makes a mistake. One day a guy named Joe pulled what Old Ket considered a faux pas and you could hear him (Ket) guffaw for ten miles around. That horse laugh made Joe mad.

Joe's chance to get even came on the day the captain of the base walked into the shop with a couple of pieces that had once been a car door handle. He wanted them welded. He asked Joe to do it but Joe took a look at the pieces, saw they were zinc-base die casting and then told the captain that Old Kettlehead was the best weldor in the shop. Ket was hooked, but good. Joe tipped the rest of the boys off that there might be some fun soon.

Unfortunately for Ket, the captain hung around waiting for the door handle to be welded. He wanted it back on his car in a hurry.

What's Wrong with This?

Here is the procedure that Old Ket followed:

He quickly ground the break, with hardly a vee at all. He didn't remove the chromium plating back from where he had ground the vee. He laid the parts out on a firebrick and ignited his torch. He used a big tip, about a No. 54 drill size (over 1/16-in. orifice) to heat the parts. Can you figure out what is going to happen?

The guys around the shop could—they were hiding behind anything and everything near Old Ket's bench—in gleeful anticipation of things to come.

They didn't have long to wait either. Old Ket had left most of the chrome on the parts and this acted just like a shell. With that poorly prepared vee, he couldn't tell where he had enough heat so he kept right on applying that big tip. All of a sudden —bloop—no part! No stage magician ever made anything vanish more quickly. All Ket had left was a puddle of molten white metal, some of which ran off the brick inside his cuffs, on his shoes and gave him a hot foot.

"You imbecile!" roared the captain. The rest of what he said is absolutely unprintable.

Drowns His Sorrows

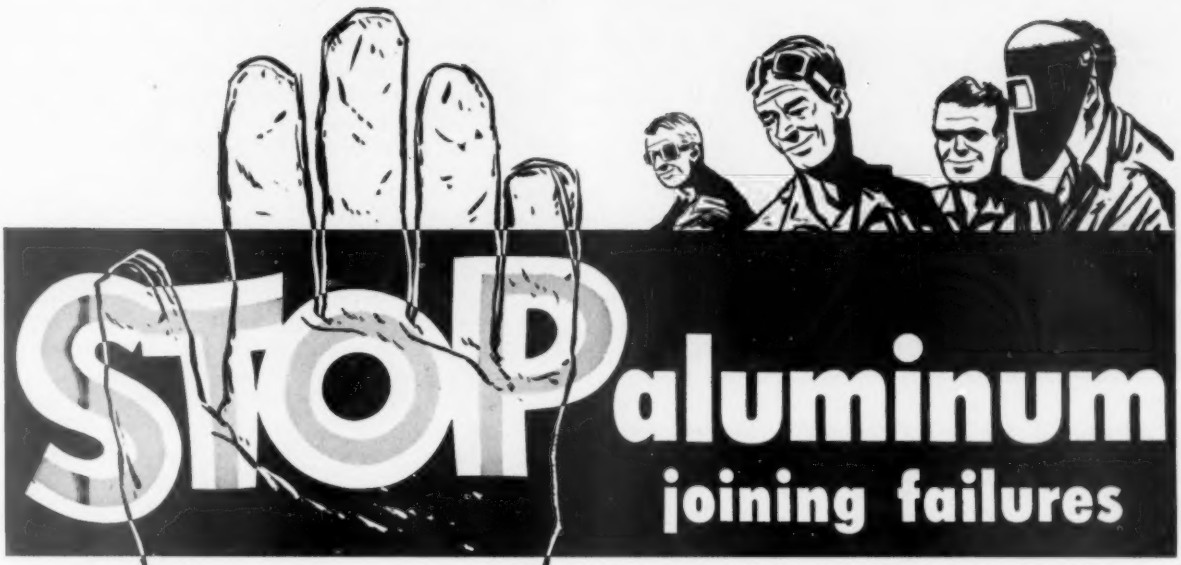
After that disappearing act, Ket kinda kept quiet for a few days, but he began taking on more and more liquid refreshment. It didn't do his disposition any good either. Ket was sour on the world, and even his good wife (this kind of a guy always gets a good wife) was threatening to leave him. In liquor or sober, Ket would proclaim in his foghorn basso profundo that nobody in the whole world or out of it could have welded that broken door handle. He didn't mention it to the captain, of course; in fact, he once walked four miles just to miss seeing the captain.

Yes, Old Ket was a pretty miserable guy. But one day he got a chance to hit back. An unlucky salesman came in the shop to demonstrate some new welding rods. Ket ran out the door, took a quick look around a nearby junk yard and came back with

Win an Encyclopedia

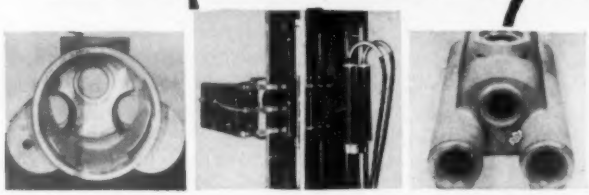
COME ON, fellows! How'd you like to win a copy of the new Welding Encyclopedia (price $7.50), autographed by its editor? Just outline a situation like Kettlehead gets himself into every month. Tell us what happened when someone you know tried to weld an unfamiliar metal, or weld by an unfamiliar method, and what was wrong. If your idea is acceptable, Clement Howard will write an Old Ket story around it, and we'll send you your Encyclopedia.

What can you lose by trying?



STOP aluminum joining failures

minimize stress, distortion, warpage with Low Temperature EUTECTIC WELDING ALLOYS



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"Our X-Ray tube housing is fabricated from eleven different parts that are assembled and welded. This assembly is then immersed in water and tested to withstand 50 lbs., air pressure to insure against leaks or porous welds. After the tube is joined, the inside of the housing is lined with lead to imprison the dangerous X-Rays.

An additional factor that makes this such a difficult metal-joining problem is the extremely wide temperature range to which the housing is subjected. The tube, ordinarily remaining at room temperature when not in use, rapidly attains a heat of 215°F. in operation, making the use of solder impractical.

Test after test of welding alloys in various price ranges had failed in one or another of the requirements. One of the chief causes of failure was the high heat at which conventional welding alloys are applied. This high heat either melted the delicate threading on the fittings or required extensive aftermachining and finishing before the crinkle finish could be applied to the completed piece.

Finally EutecRod 190, the new EUTECTIC Low Temperature WELDING ALLOY, was recommended and tested — and met *all* requirements! Expensive finishing was eliminated due to the unique thin-flowing characteristics of the alloys. Because of the low heat of application, the threads remained unharmed, rejects were eliminated, and production speed increased enormously. Tensile tests definitely proved that the strength of the joint was multiplied many times over—while the actual cost per job *decreased!*

The day we first tested EutecRod 190 was an extremely profitable one for us!"

*–M-Laboratories, Connecticut**

*Full name and address on request.

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two broken pieces of zinc die cast that had once been a door handle on a truck.

"Weld this, Buster!" he demanded in his whiskey basso.

The salesman had been around enough to know that handle was a hot potato. He didn't want to make a fool out of himself and besides the rods he was demonstrating were the wrong kind. So he picked up the parts and laid them aside without saying a word. Then Ket would slip them back again right where the salesman was working. . . This went on for quite some time. And nobody was paying much attention to what the salesman was saying or the rods he was demonstrating.

Finally, the salesman looked up to see the die-cast parts he had laid aside right back on the bench again. He knew by this time that Old Ket was going to foul up his chances to get an order if he didn't weld up that door handle. So he figured he might as well try to cut Kettlehead down to size.

The salesman asked a friendly looking spectator to grind off the door handle *properly*. This boy, not being one of Ket's admirers, did the job right. He ground off the chrome well back from the weld area and veed the break from both sides toward the center at a very low angle. As the salesman requested, he also left about 1/16-in. of the break *not* ground to give a near-perfect alignment.

Tips on Tips

After the parts had been properly ground, the salesman lined them up in some pumice paste. He then installed a very small-size tip (1/64-in. orifice), which gave him a very sharp flame cone. From his rod kit, he took a piece of bronze rod flattened on the end like a screwdriver. When he started to weld, he held the flame from the torch down on the vee real close (only half an inch away) to the heaviest side of the vee. In half a minute a blister showed up that looked just like the kind you get on your hand after mowing the lawn.

Our salesman held his torch away while he got his puddling stick (the bronze rod) and then applied the torch the same way. As the blister came into view again, he pulled the torch back just enough so the tip of the flame was on the blister. He then started to scratch it with the puddling stick. As he scratched, white shiny metal would appear where the blister was. The salesman did this all the way across the vee on each side. That gave him nice shiny metal to show him where he wanted to weld.

Only Scratched Surface

The next thing he did was to take a piece of zinc welding rod from his kit. He kept the torch far enough away so it would just melt the surface metal of the vee and scratched that nice shiny surface with his welding rod the same way. As the rod contacted the shiny surface, a little metal would melt off the end each time. Pretty soon the vee started to fill up.

The weldors watching the operation let out a cheer. The salesman finished welding one side of the part, let it cool a minute and then quenched it. He turned it over, reset the pumice around the weld and handed the torch to Kettlehead.

"I'll be an S.O.B. I'll be an S.O.B.," Old Ket was muttering.

"You are," agreed the salesman. "Now weld up this other side."

Old Ket's welding was made more difficult by the fact that his fellow workers kept giving him the raspberry and poking him in the rear with rods and tools. Maybe some day he'll learn to keep his big mouth shut.

TOUGHEST PIPELINE

(Continued from page 56)

been placed and could then be removed and attached to the second line. Pontoons for the first section were not released until the head end had been pulled ashore on the south side of the straits.

Single Big String

When the first 2,500-ft section was nearly all in the water, a second 2,500-ft length was skidded over the rollaway carriages and welded on to the first length. A 2,500-ft length of cable was then removed, and the pulling was continued until the second length was nearly all submerged. Then a third length was welded on. . . . These steps were repeated until the entire 20,000 ft had been joined into a single string of pipe.

The western line, the first of the two to be undertaken, was laid in a total time of 34 hours 19 minutes. Average pulling speed was thus around 10 fpm! When the line was in place, it was filled with water, to facilitate settling to the contour of the bed of the straits. Activity then moved to the eastern line, which was successfully pulled across in a similar manner a few weeks later.

Welding on Land Line

After the description of the straits crossing, the land construction on the pipeline may seem rather tame. While the technique employed for welding the 638 land miles of piping varied between the different contractors, in general the same basic procedure was used. One welding outfit made the root passes. This crew usually worked with a battery of three 300-amp engine-driven, truck-mounted arc welders (photo 8). The hot pass (second pass) was made from a battery of four welders mounted on tractor-pulled skids. Normally, 24 men comprised the two crews who did the root and hot-pass welds. The cap and filler passes were made by eight two-man teams (a weldor and a helper), who followed the earlier weldors down the line.

The welded joints were given an X-ray inspection. Before a pipe section was lowered into the trench, it also underwent a "holiday test" to spot areas not properly coated for protection against corrosion.

Not all weld joints were X-rayed. The usual procedure was to X-ray 20 or 30 joints, then skip a few. X-ray was by remote control. The self-propelled machine traveled on the inside of the pipe. It could go as far as 2,000 ft up the line and radiograph the full 360 degrees of all the joints. The film was wrapped around the outside of the pipe and was developed on the job in a portable darkroom.

Very Little Rework

In addition to the routine samplings of pipe joints, all the joints at railroad and railroad crossings and in the vicinity of home were X-ray inspected. Surprisingly few joints had to be cut out and rewelded. As an example, one contractor reported only 14 imperfections in 27 miles of welded pipe—certainly a very good record for over 279,000 ft of multiple-pass weld bead.

To sum it all up, this is not the longest pipeline ever constructed, but it can certainly lay a strong claim to being the toughest. It also included one of the longest, deepest and most spectacular water crossings in pipeline history.

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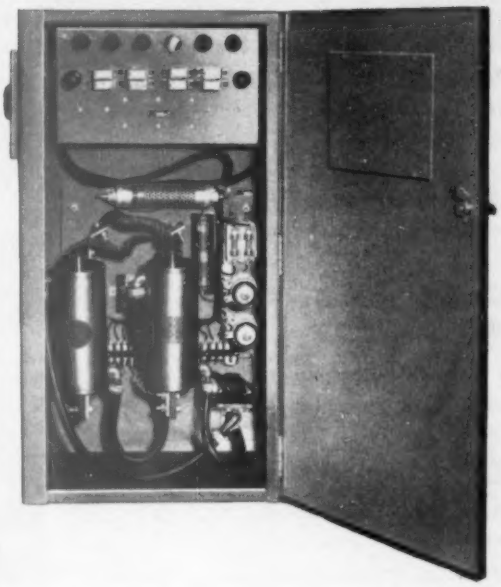

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Schenectady 5, New York

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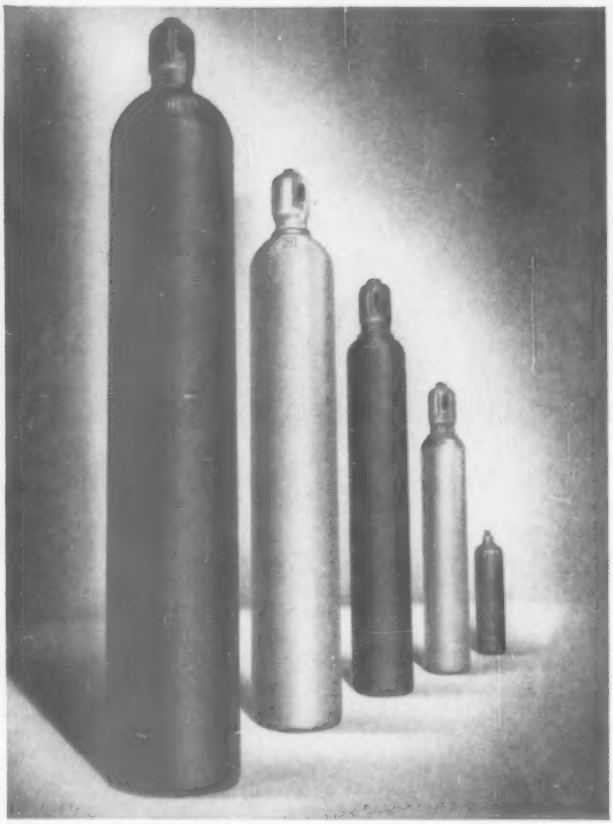

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What's the Weight of that Steel Rod?

Whether it's solid or hollow—a rod, a disc or a cylinder—this chart will prove helpful

BY W. F. SCHAPHORST

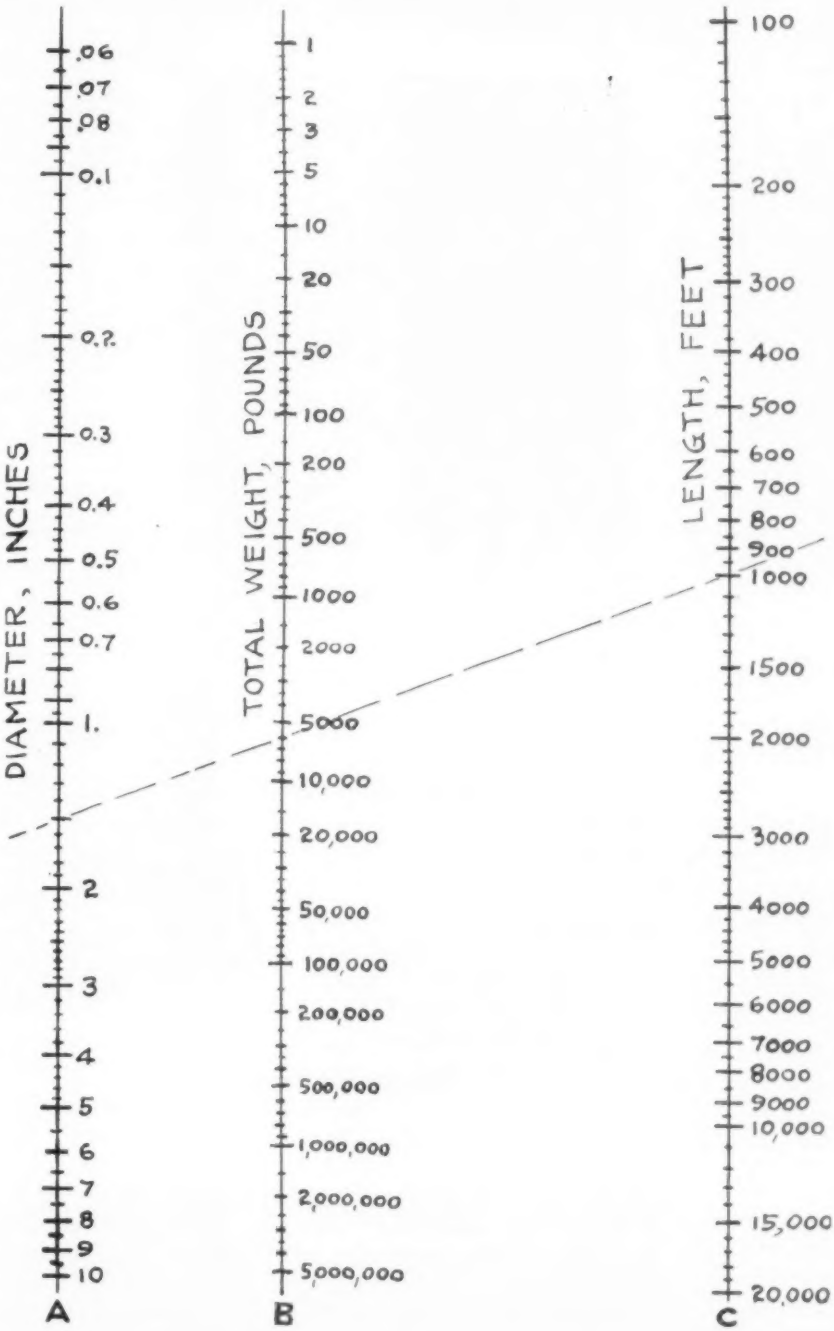
WHAT is the weight of a steel rod 1.5 in. in diameter and 1,000 ft long? To find the answer, run a straight line joining the 1.5 in column A with the 1,000 in column C. The intersection of this line with column B will tell you immediately that the rod weighs 6,000 lb.

This chart gives the weight of any steel rod, hollow tube or disc up to a diameter of 10 in. You can apply it to any length by simply shifting the decimal point. For example, since the 1,000-ft rod weighs 6,000 lb, as we have just found, it is obvious that one foot will weigh 6 lb. Or, by shifting the decimal point four places to the left, a piece 0.1 ft long will weigh 0.6 lb. Finally, a piece 0.001 ft long will weigh 0.006 lb; this, of course, would be a "disc" rather than a rod.

Subtract for a Tube

To find the weight of a tube or hollow rod involves a subtraction. Suppose, for example, that the above 1,000-ft rod is hollow and has an ID of 0.5 in. Find the weight of its core, a 1,000-ft rod of 0.5-in. diameter. By running a line from the 1,000 on column C to the 0.5 on column A, the chart tells us (column B) that the above core would weigh 700 lb if it were made of solid steel. Subtracting the weight of 700 lb from 6,000 lb, we get 5,300 lb. That is what the hollow rod (tube) 1,000 ft long, with inside and outside diameters of 0.5 in. and 1.5 in. respectively, would weigh. One ft of that hollow rod would weigh 5.3 lb. A disc 0.001 ft thick would weigh 0.0053 lb. And so on.

If you wish, you can increase the diameters given in column A. Simply add two ciphers in column B for each cipher added in column A. For instance, if the diameter of the rod is 15 instead of 1.5 in., the weight is 600,000 instead of 6,000 lb.



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The second of two articles on profits

What Are PROFITS Used For?

This is the second article on the role of profits in our economy. The first was addressed to the question: "How High are Profits?" The answer was found to be: not high when compared with previous years and the present investment in corporate facilities. This second article is addressed to the equally important question: "What do corporations do with their profits?"

In 1953 corporations will earn about $20 billion *after taxes*, if the recent rate of earnings is maintained throughout the year. These profits will be used (1) to expand and improve productive capacity through purchases of new plant and equipment, (2) to finance the operations involved in a growing volume of business and (3) to reward the people who have invested their money in American industry. Of the $20 billion, the corporations will pay about $9 billion to their stockholders as dividends. They will use the $11 billion that remains to purchase new plant and equipment and to increase their working capital.

This year corporations are increasing their plant, equipment and working capital by a total of approximately $32 billion. Of this amount, about $26 billion is for new plant and equipment. The remainder is for working capital. As this article will show in greater detail, about $21 billion of this will come from depreciation allowances and sales of new securities. The other $11 billion will come from retained profits.

It is impossible to trace exactly how each dollar of retained profits is spent. This money is mixed with other money that goes into the company treasury in the form of proceeds from loans, sale of securities and depreciation allowances. *However, it is a fact that by retaining $11 billion of their profits this year, corporations have provided $11 billion toward their total capital requirements, including the money needed for expanded and improved capital equipment.*

Profits Mean New Plants

This year American industry is engaged in a very large expansion of plant facilities. This will increase the industrial capacity of the nation by about 7 per cent. Since 1950, our capacity has been increased by about 12.5 per cent. And all of this expansion has been privately financed, even though about one-third of it was certified as necessary for national defense.

The expenditure during 1953 of $26

billion for new plant and equipment—an alltime record—imposes terrific financial responsibilities on our corporations. About one-half of the amount required will come from depreciation allowances. In general, these allowances are supposed to pay for the replacement of worn-out or obsolete equipment. Another $8 billion will be raised by corporations through new security issues and long-term mortgage loans. All together, depreciation allowances, security issues and long-term loans will provide about $21 billion. But this is still $5 billion short of the $26 billion needed for new plant and equipment this year. Thus, it is retained profits that spell the difference between expansion and standing still, between growth in the productive capacity of the economy and running downhill.

As plant facilities are expanded, corporations also need more working capital. A larger volume of business requires larger inventories, larger accounts receivable and larger amounts of ready cash to meet payrolls and bills for materials. The increase in these items during 1953 is estimated at $8.5 billion, of which about $2.5 billion will be supplied by short-term bank loans. The other $6 billion will come from retained profits. Thus, retained profits provide an essential $11 billion—$6 billion for working capital, $5 billion for new plant and equipment—to meet corporate financial requirements.

Incentive for Investment

The role of the profits that are paid to stockholders as dividends or to employees under profit-sharing plans is even more important than the role played by retained profits in providing plant, equipment and working capital. Dividend payments provide the main incentive for investment in the stocks of corporations. They are the reward for risks taken by investors. Dividends paid by corporations whose common stocks are listed on the New York Stock Exchange provide an average return of about 6.5% at present prices, and dividends on preferred stocks average about 4.5% return. Dividends are distributed among 6.5 million stockholders. Also, it is estimated that 3 million employees now are covered by profit-sharing plans. These plans increase the incentives of both production workers and managers to work harder and more efficiently.

Thus, more than 9 million Americans have a *direct* financial stake in corporate profits through ownership of stock or participation in profit-sharing plans. But *all* Americans share indirectly in the rewards of a successful business year. Investment of a major part of 1953 profits in new plants and equipment means more employment opportunities and better working conditions for labor. For the nation, it means new industrial capacity that is essential both for national defense and to produce more and better goods for a rising standard of living.

Corporate profits after taxes represent about 6% of the nation's total income. But the job they do to stimulate investment and to finance industrial expansion and improvement is more far-reaching and more essential to the prosperity and well-being of the American people than would be suggested by that small figure.

McGraw-Hill Publishing Company, Inc.

CODE TROUBLES

(Continued from page 67)

were welded into each tank to eliminate the hazard of explosion in the event there was a tendency for the liquid propane gas to build up an excessive pressure. Photo 2 shows these valves and also the "roll-over" protection provided around them. This is designed to save the valves from damage in case the trailer should be rolled over in an accident.

It is also interesting to note in photo 2 how I-beams were cut to size and proper contour and welded between the tanks to tie them together. A similar set of I-beams welded beneath the tanks makes an extremely rigid, durable unit.

Now We Write Reports

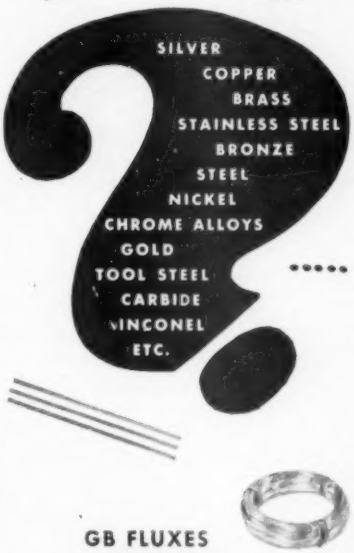
When the twin tank trailer unit was finally completed, its manufacturer's troubles had just begun. First, an inspector from the National Board of Boiler and Pressure Vessel Inspectors had to inspect the vessels. Manufacturer's Data Forms U-1 had to be filled out by Trailmobile and signed by the inspector who had inspected the vessels. Copies were sent to the National Board of Boiler and Pressure Vessel Inspectors, which submitted one of these copies to the proper authority of each state in which the trailer was scheduled to operate. Trailmobile, of course, retained copies of the report for its own file and sent other copies to the customer, the Union Carbide and Carbon Co. This procedure is again in compliance with Interstate Commerce Commission regulations and ASME Code regulations and is designed to give the customer assurance that his pressure vessel trailer was manufactured under the proper governing regulations.

All of this report writing would seem to be enough for such a job, but there was still another report to be prepared. It was submitted in duplicate to the customer, who, in turn, had to register the trailer with the Bureau of Explosives so that department would be aware of the existence of the unit.

It's not the welding; it's the paper work that really takes it out of you.

* * *

Life is the art of drawing sufficient conclusions from insufficient premises.
—Samuel Butler



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GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
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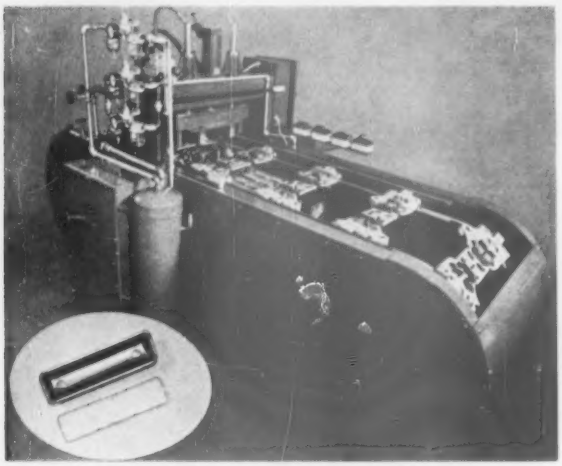
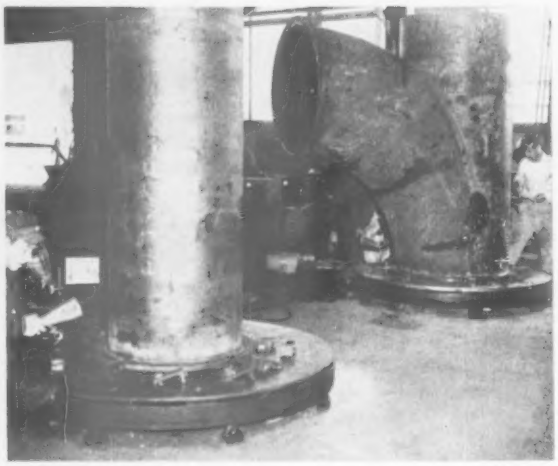


RESISTANCE welder makes 12 simultaneous spot welds



OFF-CENTER loads show no tilt with this positioner

Multiple Spot Welder

The particular machine pictured above was made to weld retainers to valve gasket covers. Twelve spot welds are made simultaneously by means of a continuous chain conveyor that carries the 12 fixtures. These fixtures are moved intermittantly by an air cylinder, and their positive location is obtained by an air-operated stop pin. When a fixtures comes into the welding station, an air-operated clamping cylinder exerts a force downward on the part. This pushes the fixture onto locating pins and the valve cover over the back-ups.

This same principle can be applied to other types of operations, states manufacturer.

MULTI-HYDROMATIC WELDING & MFG. CO., 23171 Groesbeck Hwy., East Detroit, Mich.

* * *

Pressure Tester

A NEW vertical pressure-testing machine detects and locates leaks in castings as well as in brazed, welded and soldered assemblies. The air-operated, electrically-controlled machine subjects parts to a 10-second automatic check in which the part, or a specified area in the part, is charged with a given volume of air. Loss of air pressure, indicating a leak or flaw, is indicated by signal lights through a sensitive measuring system.

The machine is designed to provide maximum production speed with minimum loading time. Push-button controls are located so that minimum hand motion is required to load the machine and control the test cycle.

Of welded steel construction, the machine weighs about 800 lb. It is 6½ ft high, 38 in. wide and 26 in. deep.

HAUTAU ENGINEERING CO., 721 Wanda, Ferndale 20, Mich.

* * *

Sealer Welding Rod

A LOW-melting-point alloy, "Eutec-Rod 115," is for use on cast iron to seal cracks or to build up worn and poorly machined surfaces where strength is not required. The product is said to offer new advantages in lower bonding heat, quicker timing action, longer working range and easier spreading.

Although primarily designed for cast iron, the new alloy can also be used on bronze, steel castings, in fact for filling and bonding any metal except aluminum and magnesium. It is available in a full range of sizes.

EUTECTIC WELDING ALLOYS CORP., Dept. P, Flushing, N. Y.

* * *

Shielded Studs

A THIN aluminum coating over the entire surface of a mild steel stud acts as an effective flux for the welding end and also protects the rest of the stud from chemical attack and rust. With this feature, fully threaded studs can be welded at either end.

SHIELDED STUD WELDING CO., 1540 Seabright Ave., Long Beach 13, Calif.

Off-Center Positioner

SPECIFICALLY designed for carrying heavy loads off center, a new positioner offers a variable-speed range and operates in both clockwise and counterclockwise directions. It permits easy automatic welding on such heavy items as 10-in. pipe with elbows that make the item off center in weight, states manufacturer.

UNIQUE TURNTABLE CO., 1895 Park Ave., New York City 35.

* * *

Acid-Resistant Hose

COMPOUNDING of a new special synthetic with other materials has resulted in a new hose that is highly resistant to a wider range of acids, salts and alkalis, according to the manufacturer's claims. It is said to be able to convey other solutions previously not recommended for rubber hose.

RAYBESTOS-MANHATTAN, INC., Manhattan Rubber Division, Passaic, N. J.

* * *

Pocket Microscope

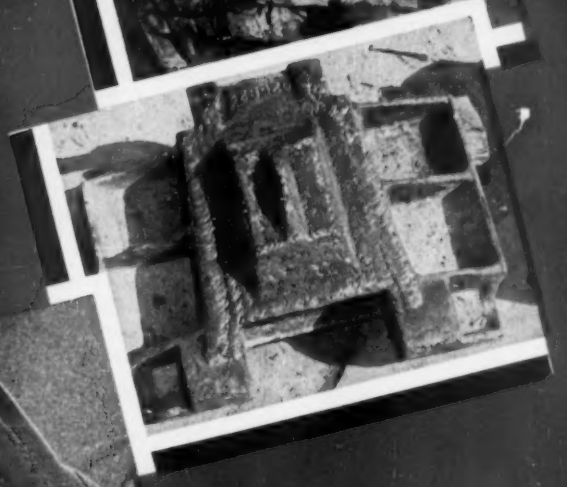
FOR fast accurate measurement of flaws, pin holes, cracks or other defects in welds, eastings or forgings, the Edscorp "Pocket Comparator" gives 6 power magnification. Its reticle is calibrated to measure angles, radii, circles and linear dimensions, in both decimal inches and millimeters. It can be used to check layouts, machining on tools, dies and gages.

EDMUND SCIENTIFIC CORP., Dept. 299, Barrington, N. J.

For Low-Cost, High Impact Strength

STOODY 1027

The manual hard-facing rod that cuts wear on EARTH-MOVING, ROAD-BUILDING AND SIMILAR HEAVY EQUIPMENT!



If you want low-cost wear protection, STOODY 1027 is for you! Here's an all-position AC-DC electrode that lays down a smooth, uniform deposit or can be applied in multiple passes for higher build-ups. Requires no slag chipping between passes. Runs free from slag interference and bonds readily to plain carbon, alloy and manganese steels as well as cast iron. Deposits are forgeable.

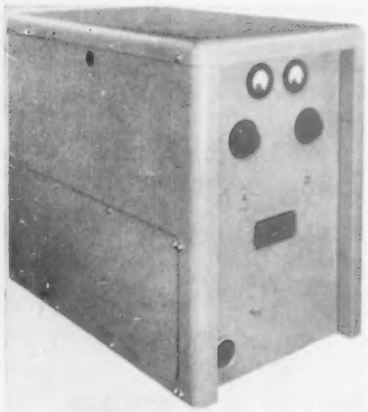
TYPICAL APPLICATIONS

STOODY 1027 is ideal for manual, hard-surfacing large bulky parts too heavy to position for down-hand welding. Typical uses: tractor rollers, bucket edges, drive sprockets, top carrier rolls, idlers, tumblers, track pads, clutches, clevises, sheaves, grousers, gear teeth, etc.

Ask your dealer for details (see the yellow pages of your phone book) or write direct.

STOODY COMPANY

11961 East Slauson Avenue, Whittier, California



Constant-Voltage Welder

THIS new welder is said to deliver precisely the preset arc voltage regardless of load conditions. It can be used for automatic welding of all types — inert-gas, submerged-arc, semiautomatic, and even stud welding.

The machine consists of a three-phase autotransformer, power transformer and selenium rectifier. The specially designed circuit is capable of delivering direct current at the desired preset arc voltage while operating from any suitable three-phase a-c power supply.

The manufacturer claims the welder does not have the "droop" characteristic of former welders with high open-circuit voltage. The voltage variation between the open and loaded conditions equals the resistance in the circuit. Variation of arc ignition is said to be negligible.

The machine provides variable primary connections for 208, 220, 240, 440 or 480-volt line connections and a 110-volt receptacle for operation of welding head controls, flux pickups, etc. Total weight is about 700 lb.

GLENN CO., 3134 E. Tenth St., Oakland 1, Calif.

* * *

Iridium Isotope

A RADIOACTIVE isotope, iridium-192, is now available for nondestructive inspection of steel from ¼ to 1-in. in thickness. This iridium source of gamma rays is said to provide 2% definition in steels and also give good results when used on aluminum and magnesium.

The active 2 mm by 2 mm source is sealed in an aluminum capsule, which is attached to a steel head for ease of handling with a remote magnetic handler. The standard source strength is 1.25 curies.

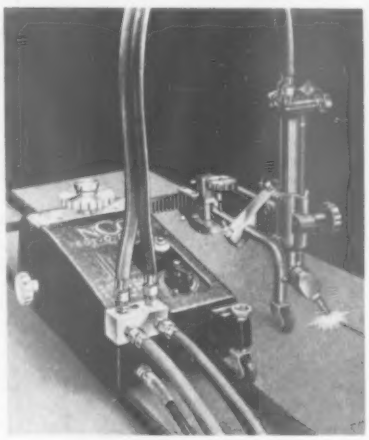
TRACERLAB, INC., 130 High St., Boston 10.

Metal-Coated Electrode

"JETWELD" is a contact or "drag" electrode that operates best when the coating is actually touching the work. This new electrode incorporates powdered metal into its heavy coating. For operation in flat or near-flat positions with a-c or d-c, "Jetweld" is said to meet the physical requirements of class E-7016 electrodes. It can be used on work calling for E-6012 or E-6020 electrodes. As-welded physical properties are: tensile strength, 93,000 psi; yield point, 79,000 psi; elongation in 2 in., 15 to 22%. This new electrode is available in sizes of 5/32, 3/16 and ¼ in.

THE LINCOLN ELECTRIC CO., 22801 St. Clair Ave., Cleveland 17.

* * *



Cutting Torch

ACCURATE bevel cutting regardless of uneveness in steel plate is claimed for a "Floating Torch" assembly developed by National Cylinder Gas Co. Designed for use with the firm's "Cut-O-Matic" portable cutting machine, the new attachment comprises two principal parts: a guide wheel and a newly designed bevelling torch. The former rests on the plate and controls the distance between the torch tip and plate. It automatically raises or lowers the torch to compensate for any unevenness.

The torch is equipped with a swivel head that permits rotation of the tip to cut whatever angle of bevel is required for subsequent welding operations.

The "Cut-O-Matic" itself is a motor-driven machine weighing less than 50 lb and can cut straight lines, circles, arcs, rings, strips and various irregular shapes. It will cut thicknesses up to 7 in. with a two-hose torch and up to 16 in. with a special three-hose torch.

NATIONAL CYLINDER GAS CO., 840 N. Michigan Ave., Chicago 11.

Cycle Converter

DEMAND for a convenient 400-cycle supply can be met by this new "No-brush" motor-generator that converts 60 cycles to 400 cycles. Outputs of 150 volt-ampere to 25 kva, single or three-phase, are available with motor drive for any standard frequency or voltage.

Operation is said to be free of radiofrequency noise, although the converter needs no filters or suppressors. Overall dimensions of the motor-generator are 18 in. in diameter by 16 in. high. It weighs 247 lb.

GEORATOR CORP., Manassas, Va.

* * *

Gas Generator

ENDOTHERMIC (heat-absorbing) gas generator produces a controlled atmosphere for heat-treating operations, including bright hardening of high-carbon steels, bright hardening of molybdenum, tungsten and cobalt high-speed steels, or annealing and normalizing.

This generator is available in capacities of 300, 500 and 750 cu ft per hour. Overall length is 7 ft, width 4 ft.

HEVI DUTY ELECTRIC CO., 4212 W. Highland Blvd., Milwaukee 1.

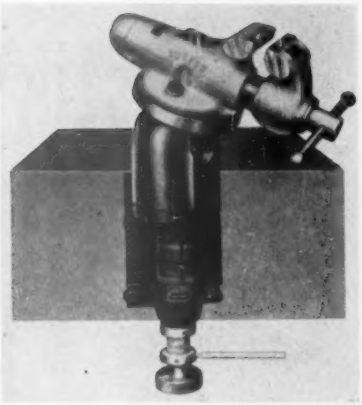
* * *

Electric Hammer

PEENING and cleaning of weld seams, chipping, chiseling and gouging are said to be much easier with the new "Super Slugger" electric hammer. It employs Neoprene blocks to give snap to each of the 3,000 blows per minute.

A new slide shoe made of molybdenum disulfide and a new oil reservoir have been added for longer continuous performance. Six new holding chucks and a number of new tools now broaden the line of work that may be done with the 7½-lb "Super Slugger."

TEMPO PRODUCTS CO., 2075 E. 65th St., Cleveland 3.



Hydraulic Positioner

ABILITY to support up to 1,000 lb is claimed for a new heavy-duty "PowRarm" positioner. Regular "PowRarm" models have had capacities of 24, 70 and 150 lb. This new product increases maximum weight limits almost 700%.

The positioner can be used as a fixture in many production or assembly operations. It can be mounted vertically or horizontally. There is a slotted base for use with drill presses, shapers and milling machines. Its hydraulic action permits an operator to make a change of position under partial tension, which prevents the work from accidentally falling.

WILTON TOOL MFG. CO., 925-941 Wrightwood Ave., Chicago 14.

* * *

Flux For Stainless

"STAINLESS STEEL 48" is the name of a new soldering flux specially developed for use on stainless steel, Monel, Inconel, nichrome, chromium, manganese, molybdenum, tungsten and vanadium alloys. It is said to remove all oxides and to help the solder flow at the lowest possible temperature. Suitable for soldering iron, flame or dip soldering, it is claimed to promote high capillary action of the molten solder.

REMONT MFG. CO., 1310 Myers Rd., Lombard, Ill.

* * *

Speed Attachment

A NEW high speed attachment for its Strand flexible shaft machines has been announced by N. A. Strand Div. The attachment clamps onto the motor the same way as a standard flexible shaft. Step-up gears are in the attachment rather than in the hand-piece, saving weight in the latter. Top speeds range from 13,500 to 36,000 rpm.

N. A. STRAND DIV., Franklin Balmar Corp., Woodberry, Baltimore 11.

ACCO products for Stainless Steel WELDING

How Do You Buy It?

• No matter how you buy stainless steel welding wire—on reels, in coils, or packages of rods or electrodes—PAGE can supply you in a variety of analyses.

AC-DC Electrodes—Gas Welding Rods Stable burning even at lower heats. Slag is clean and easily removed. Coating resists cracking right down to short stubs. Your choice from a complete line for every type of stainless welding.

for Inert Gas Welding

Six Page-Allegheny stainless grades in .035", .045", and .0625" diameters. Precision thread-wound on 25-lb. non-returnable reels to fit popular arc welding machines.

for Submerged Arc Welding

PAGE stainless in wire diameters from 1/32" to 5/16", plain or copper coated. In layer-wound coils, 22" or 24" mill coils, or 200-lb. returnable steel reels.

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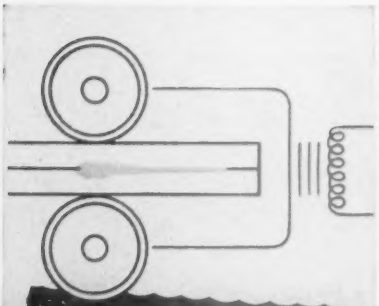
PAGE Welding Electrodes Rods Wire



YOU GET:
2½ Times the Life–More Production and Lower Costs

...from AMPCO WELD* Seam Welding Wheels

UP to 150% longer service life — that's the record reported by users of Ampco Weld tube and seam welding wheels. And here's why: Ampco Weld wheels have unusual hardness and toughness at elevated temperatures — exceptional resistance to wear — extra durability. And they also have uniformly high electrical conductivity. All this adds up to longer runs, fewer shutdowns, increased production, lower costs.

You can order Ampco Weld wheels as rough forgings, finished blanks, or fully machined, as you prefer.

Ampco Weld wheels are part of an extensive line of Ampco resistance-welding products. All meet or exceed RWMA specifications. And Ampco offers you free, expert engineering service for specialized applications, if you want it. Order Ampco Weld wheels today — watch production step up, costs step down.

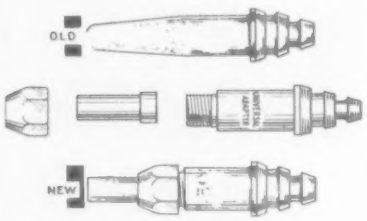
AMPCO **Ampco Metal, Inc.**
DEPT. WE-12
MILWAUKEE 46, WISCONSIN
West Coast Plant: Burbank, California
*Reg. U. S. Pat. Off. MW-7

Inspection Mirrors

ADJUSTABLE mirrors, similar to those used by dentists, facilitate visual inspection behind gears, inside the angle of a pipe, underneath a fitting and in other difficult-to-see spots. Round mirrors come in diameter sizes of 1½ and 2¼ in. Rectangular mirrors are 1⅜ by 2⅛ in. and 2¼ by 3¼ in. Plastic handles vary from 9½ to 18½ in. Sleeves on handles permit adjustment within an arc of 45 deg.

F. P. KRETCHMER, 3540 Dunn Dr., Los Angeles 34.

* * *



Renewable Tip End

REPLACEMENT of welding tips is minimized by a new tip-end adapter, which becomes part of the cutting torch. When this adapter is in place, only the tip end need be renewed to obtain a perfect cutting tip. The new tip ends are interchangeable and will fit any cutting torch with the use of the adapter. The three-piece construction is said to facilitate cleaning and assure longer life.

EVANS MACHINE CO., 122 S. Calverton Rd., Baltimore.

* * *

L-P Torch

A NEW L-P gas torch made by The Turner Brass Works does not require a pressure regulator and has removable orifice blocks in each of its three interchangeable tips. Flame adjustment is accomplished by a one hand valve control.

Turner also makes fire pots that feature heavy corrosion-resistant cast aluminum bases, steel supporting posts, cast iron burners with a wide flame range and brass assembly parts. They operate at full tank pressure without regulator.

THE TURNER BRASS WORKS, Sycamore, Ill.

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each
gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

FREE —*Tempil° "Basic Guide to Ferrous Metallurgy"* — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
11 WEST 25th STREET
New York 11, N. Y.

Dependable Westinghouse A-C Welders pay off...this time for Avery and Saul Company

The 40 Westinghouse A-C Welders (from 200 to 1500 ampere capacity) at the Avery and Saul Company, Cambridge, Massachusetts, are on the job 24 hours a day—every day. Their outstanding record—not one single case of out-service for repairs—has contributed to this company's rapid growth as recognized "specialists in steel plate fabrication".

Even the toughest corner weldments are no problem to this production-minded fabricator. Absence of arc blow and ease in using heavier electrodes with higher current insure good welds in all positions—at higher speeds. And since power source is an important factor in their operation, Avery and Saul was quick to recognize a sharp reduction in power costs, too. With the built-in power-factor correction feature on the Westinghouse a-c sets, their demand rates are kept low and they pay only for current actually used.

Westinghouse can help *you*, too—with skilled application engineering and industry's *most* complete arc-welding line.

Call your nearest Westinghouse Welding Distributor, or write Westinghouse Electric Corporation, Welding Division, P. O. Box 868, Pittsburgh 30, Pa. For helpful literature just send in the attached coupon.

J-21816

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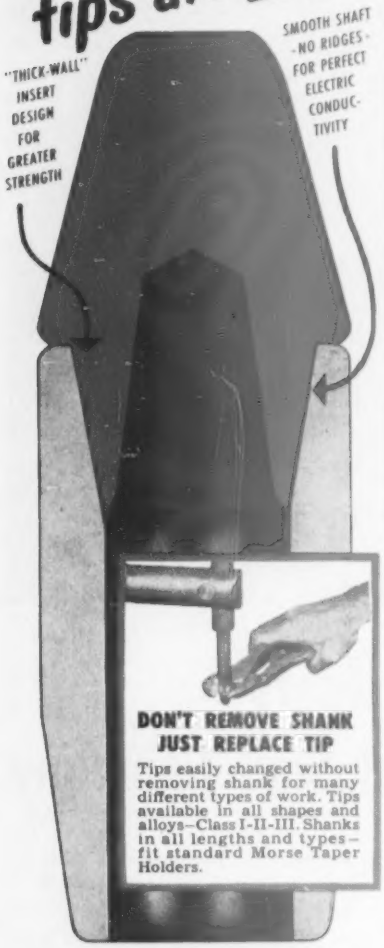
- ☐ B-5455 Type EW-20 Engine-Driven Welder
- ☐ B-5622 Type HC Industrial A-C Welders
- ☐ B-5453 D-C Arc Welder Type RA

NAME_____ ADDRESS_____

CITY_____ STATE_____

W. E. 12-53

Pacific REPLACEABLE tips are tops!


"THICK-WALL" INSERT DESIGN FOR GREATER STRENGTH
SMOOTH SHAFT -NO RIDGES- FOR PERFECT ELECTRIC CONDUCTIVITY
DON'T REMOVE SHANK JUST REPLACE TIP
Tips easily changed without removing shank for many different types of work. Tips available in all shapes and alloys—Class I-II-III. Shanks in all lengths and types—fit standard Morse Taper Holders.

fully water-cooled . . .
original and best — Pat. 2,440,463

PACIFIC TIPS are the famous *replaceable* spot weld tips that are *irreplaceable! Accept no substitutes!* For finest performance at lowest cost be sure you get PACIFIC. Users report savings up to 50%. Scientific design fully protected by patent. Saves machine down time, wear and inventory costs. Use in machines, portable guns . . . in straight or offset holders. Get complete information and prices today.

Pacific

Distributors in Principal Cities

Smith Bros. & Hughes

5304 Banks St., San Diego 10, Calif.

Manufacturers—resistance welding electrodes and accessories, automatic screw machine products

Inquire for Distributor and Dealerships

Pocket Magnet

TESTING surface coats for magnetic properties of the under material is one of the uses of a new pocket-size magnet. Made of a super-magnetic alloy, it also removes chips from blind drill and tap holes.

The unit, no larger than a fountain pen, is mounted in a fibre non-conductive case with a pocket clip. "Model 15" of the "GS" magnet is ¼ in. in diameter, and "Model 16" is ⅜ in. in diameter. Length of the pocket case is 6¼ in.

GENERAL SCIENTIFIC EQUIPMENT Co., 2700 W. Huntingdon St., Philadelphia 32.

* * *

Deburring Tumbler

WELDING slag, flame-cutting slags, burrs and rust are removed from weldments in the "BurrMaster" barrel tumbler. Time saved is said to range from 33 to 90% over hand methods. The compact unit is made of welded steel construction. The insides of both barrel and barrel door have neoprene linings that not only greatly extend barrel life but assure quiet operation.

WHITE-ROTH MACHINE CORP., Lorain, O.

* * *

New Electrode

NEWEST entry in the 8016 field of low hydrogen electrodes is the "Weldbest 8016". It is said to produce a weld deposit having 3% nickel with either a-c or d-c reversed polarity welding. Charpy impact tests of weldments conducted at -150 F gave the following results: notch in the weld, ft-lbs, 24.0, 23.0 and 22.5; notch in the heat affected zone, ft-lbs, 32.0, 29.5 and 33.0. Samples on request.

WELDWIRE CO., INC., NW Corner Emerald and Hagert Sts., Philadelphia 25.

Sellstrom QUALITY EYE AND FACE Safeguards

Goggles That Accommodate the Largest Prescription Glasses

No. 610

Here are extra large Welding Goggles. The narrowest inside measurement is 5½ inches but can be adjusted to 6½ inches wide. They will accommodate with room to spare the largest prescription glasses worn by any of your welders. They stop all complaints regarding size. Here are additional advantages offered by these No. 610 Goggles:

1. Frames of one-piece construction, tough plastic, perfectly balanced. Patented adjustment feature permits fitting any face.
2. Four light-proof ventilators on each eye cup furnish an abundance of air ventilation, reducing fogging to a minimum.
3. One hand pickup. The entire goggle is a single unit. Standard 50 m/m lenses.
4. Rolled edges designed for utmost comfort.

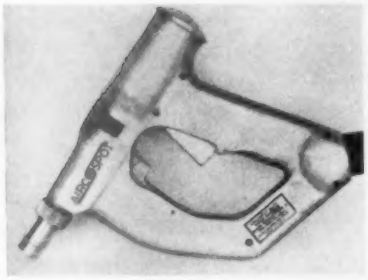
The No. 612 Industrial Goggles are the same jumbo size construction but molded of clear plastic for wide vision and with the conventional screen ventilators.

Order from your dealer. At your request we will mail you a pair of either or both goggles on memo for test purposes.

sellstrom MANUFACTURING COMPANY

Eye and Face Safeguards— Designed for Comfort

626 N. Aberdeen St. Chicago 22, Ill.



Tig Welding Gun

THE "Aircospot" is a lightweight inert-gas spot-welding gun that uses a 3/32-in. non-consumable thoriated-tungsten electrode. The outfit consists of a water-cooled hand gun, control panel and the necessary hoses and cables. A standard d-c source of power is required. Either helium, argon or a mixture of the two may be used for a shield. The gun is rated at 250 amp and will spot weld sheets up to 1/8-in. thick without the need for a ground connection to the back of the work.

AIR REDUCTION SALES CO., 60 E. 42nd St., New York City 17.

* * *

Radiation Exposure

A FILM badge service has been designed specifically to record exposure to gamma radiation. The company management writes the name of the wearer and the date on each badge as it is issued. The badges, together with an unused badge for control, are then mailed weekly for processing to Technical Operations, Inc. The films are then compared with prepared standards, and the results are reported to the customer. The badges, with film inside, remain on file at Technical.

The film badges are offered in lots of 20, 50, 100 or 500. The records kept by the firm are in accordance with requirements of the Atomic Energy Commission.

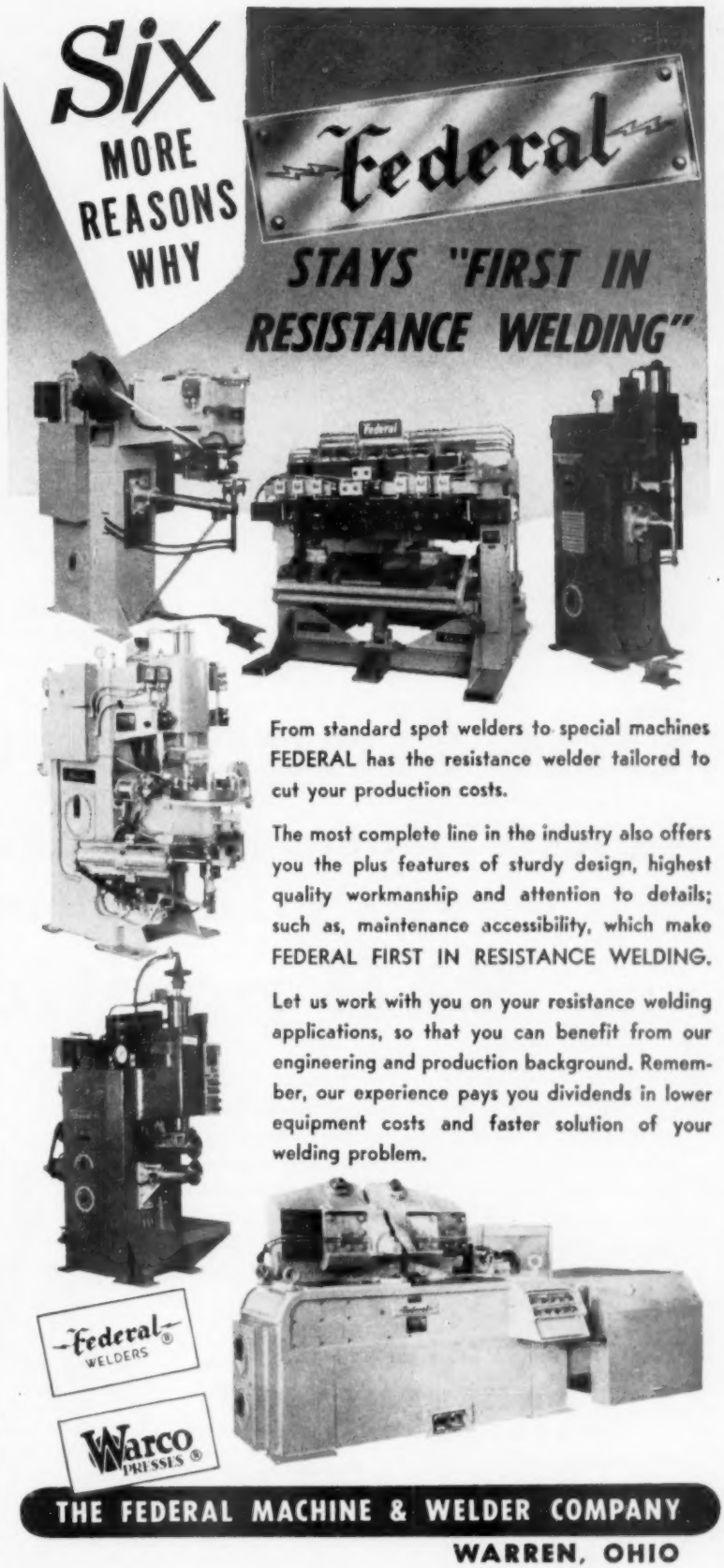
TECHNICAL OPERATIONS, INC., 6 Schouler Ct., Arlington, Mass.

* * *

New Carbon Brush

A NEW and improved carbon brush design called the "Multiflex" utilizes a Neoprene pad to hold multiple brush components together. It is claimed to give better contact, reduce vibration and cut down circulating current. The greater brush flexibility eliminates uneven brush wear and improves brush life. They are tailor-made and need not be cut down to fit the commutator.

HELWIC CO., 2540 N. 30th St., Milwaukee, Wis.


Six
MORE
REASONS
WHY
Federal
STAYS "FIRST IN
RESISTANCE WELDING"
From standard spot welders to special machines FEDERAL has the resistance welder tailored to cut your production costs.
The most complete line in the industry also offers you the plus features of sturdy design, highest quality workmanship and attention to details; such as, maintenance accessibility, which make FEDERAL FIRST IN RESISTANCE WELDING.
Let us work with you on your resistance welding applications, so that you can benefit from our engineering and production background. Remember, our experience pays you dividends in lower equipment costs and faster solution of your welding problem.
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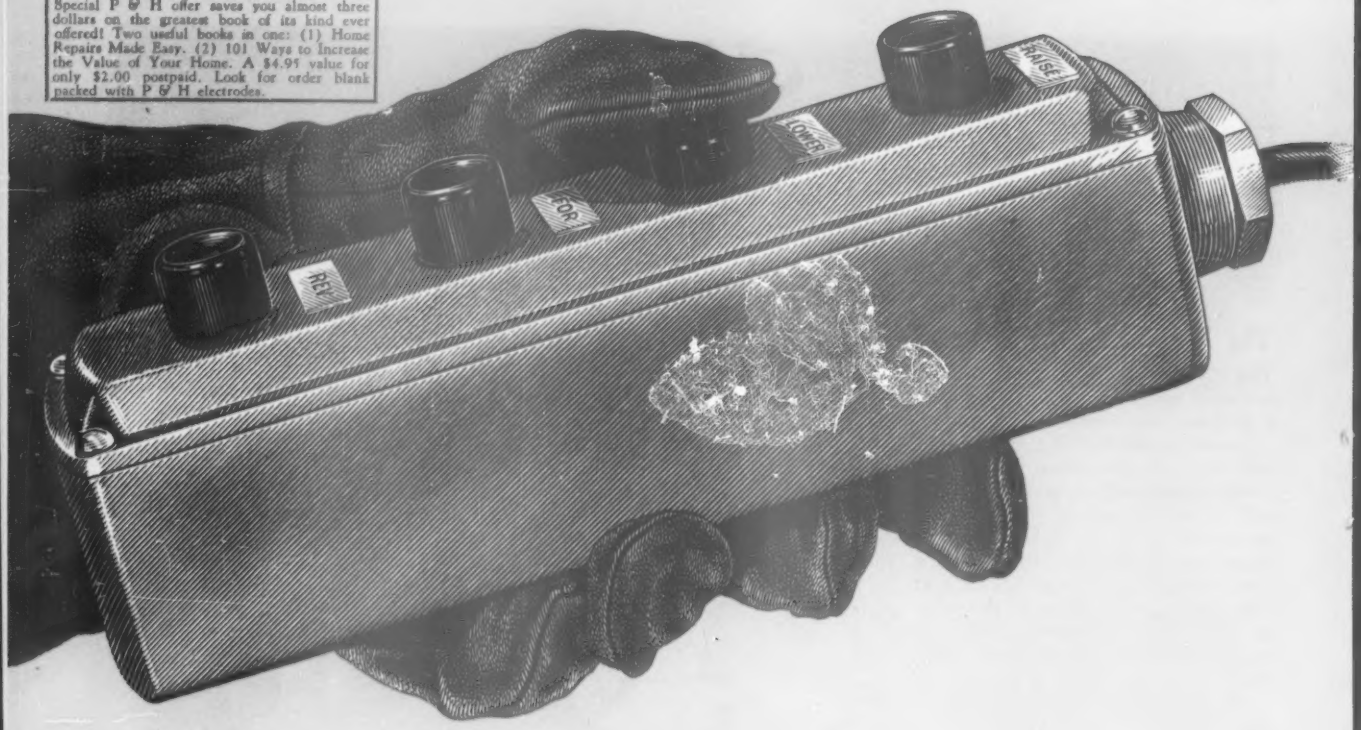
WELDORS! *Have you taken advantage of this money-saving offer?*

Special P & H offer saves you almost three dollars on the greatest book of its kind ever offered! Two useful books in one: (1) Home Repairs Made Easy. (2) 101 Ways to Increase the Value of Your Home. A $4.95 value for only $2.00 postpaid. Look for order blank packed with P & H electrodes.

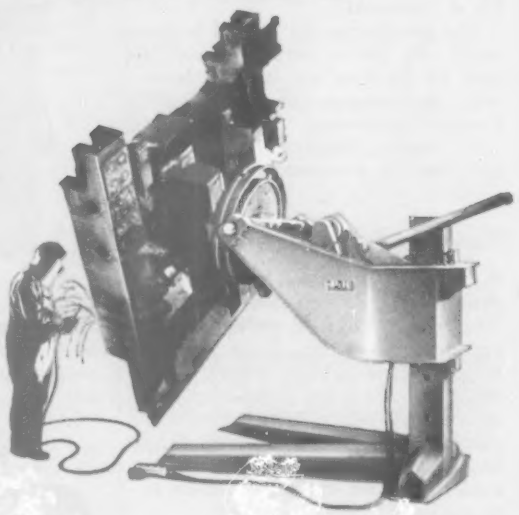


One finger is enough

to position heavy workpieces for fast, economical downhand welding

- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.



P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 WEST NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

the P&H *Line*

Russian Repair Depot Personnel Taken to Task

MANAGERS and workers in Russian rural repair depots have been blistered by the official government newspaper, *Izvestia*, for their failure to adopt metallizing as a means of keeping agricultural machinery operating in the face of spare-part shortages.

Izvestia said that although the process was developed and used before World War II it is only now being introduced in many areas of Russia. The official organ said, "There are still many workers who don't want to trouble themselves with innovation but prefer to demand spare parts from the government for repairing their machines."

The paper further stated that at one repair depot "metallizing equipment stood idle for almost two years, while the director, chief engineer and regional manager literally assaulted the supply organizations for new crankshafts and other spare parts. Even in the shops where the process has been introduced, the work is not organized properly, and no attention is given to increasing the quality and lowering the cost of the work."

—*McGraw-Hill World News*

* * *

New Packaging Method for Wheelabrator Abrasive

A NEW method of packaging and shipping its Wheelabrator steel shot has been developed by American Wheelabrator & Equipment Corp., Mishawaka, Ind. The new packages consists of 50-lb fiber-board cartons of the blast cleaning and peening abrasive. These replace 100-lb bags. Shipments are made on disposable pallets each holding 1 ton of shot.

* * *

New York U. Students Win Lincoln Award

Two New York University students won the James F. Lincoln Arc Welding Foundation's top engineering undergraduate award of $1,250 for their paper describing the "Design for A Welded Continuous Curved Girder Highway Bridge." The authors were Clayton Wilkie and Henry Cohen. As additional recognition, the Foundation presented $1,000 to the university for the use of scholarships to be named in their honor.

Second award of $1,000 went to Thomas J. Feaheny, Jr., who described the "Design of Material Handling Containers for A Forge Shop." The University of Detroit received $500 in scholarship funds honoring this achievement. The $500 third award was made to William J. Chancellor of the University of Wisconsin for his paper describing the "Design and Construction of a Chain Mower." The university received $250 for a scholarship in his honor.

The engineering undergraduate awards are given for papers on welded design of machines and structures.

* * *

Maintenance Conference to Have 59 Sessions

A THREE-DAY Plant Maintenance and Engineering Conference, scheduled for Jan. 25-27, will have 59 conference sessions on its program. It will be held at the Hotel Conrad Hilton, Chicago. The largest conference of its kind in the industrial field, it will be held in conjunction with the Plant Maintenance and Engineering Show, which will be conducted Jan. 25-28 in the International Amphitheatre, Chicago. It will be the fifth year for both events.

* * *

Cobalt Used to X-Ray Steel Building Beams

AN AMOUNT of radioactive cobalt so tiny it was hardly visible to the naked eye was recently used to radiograph huge steel beams of a building on the University of Illinois campus. E. L. Stouffer, the university's supervising architect, explained the radiographic inspection was necessary to determine whether any of the welds in the beams was defective. The cobalt and a crew of technicians were furnished by X-Ray Inc., Detroit.

* * *

Gas Pipe Installed at Rate of 400 ft per Hour

STEEL pipe of 34-in. diameter in 64-ft-long sections is being welded and covered at an average rate of 400 ft per hour for the Pacific Gas and Electric Co.'s Super Inch natural gas line.

The 88-mile expansion project down the San Joaquin Valley is the first part of 220 miles of new "loops" being laid parallel to the original 502-mile line. Trenching machines lead the way, with welding crews leap-frogging each other a short distance back. Large earthmoving equipment follows in their wake, filling the ditch.

The job was started at a point south of Kettleman Hills in Fresno county and will extend to near Arvin, Kern county. Contractor for this portion is Engineers Limited Pipeline Co. of San Francisco, whose crews are working ten hours a day, six days a week. To date, progress has been in excess of 4,000 ft daily. The project is scheduled to be completed in April.

P&H

Arc Welders and Electrodes

put welding in your plant on a low-cost, high-production basis

P&H DC RECTIFIER WELDER

Has Dial-lectric Control for instantaneous heat selection at the work. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING TWINS

P&H AC WELDER

Has P&H Dial-lectric Instantaneous Remote Control. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WN-301 Engine-Driven DC ARC WELDER

Portable. Equipped with Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

P&H LOW-HYDROGEN ELECTRODES

13 types that take the problem out of welding high-sulfur, free-machining, low-alloy, and high-strength steels; castings, etc.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

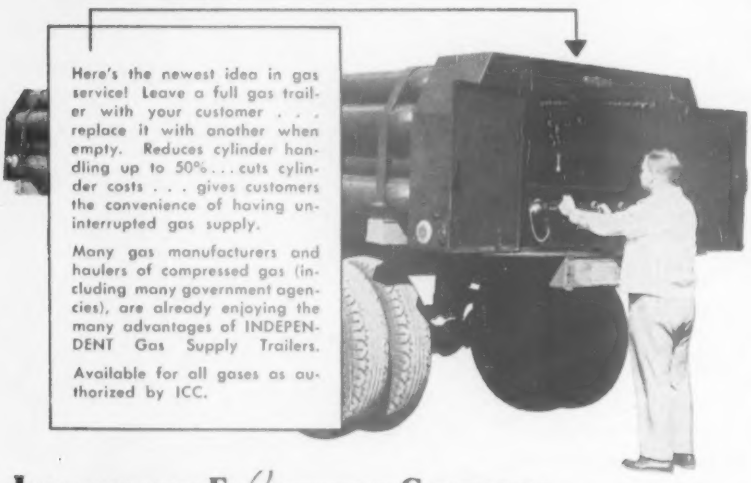
P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4513 W. National Ave., Milwaukee 46, Wis.

REDUCE CYLINDER HANDLING

Up to 50% with INDEPENDENT Gas Supply Trailers!



Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50% . . . cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.

INDEPENDENT ENGINEERING COMPANY, Inc.

CONSULTING · DESIGNING · RESEARCH

Manufacturers of

CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

We Invite Your Inquiries

BECKER HAS IT OR CAN MAKE IT!

IF IT'S CARBON

KEEN-ARC CARBONS

Cored and heavily copper coated for twin arc torches.

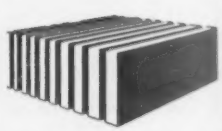
WELDER BRUSHES

The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

PLATES



1/4" thickness and up.

PASTE

Heat resistant, easily molded.

PLATES and PASTE ASSORTMENT

$24.50

A handy assortment, developed especially for welding departments or small welding shops.

COMPLETE BECKER ENGINEERING SERVICE
is always available and entails no obligation whatever.

BECKER BROTHERS CARBON CO. 3450 SOUTH 52nd AVENUE CICERO 50, ILLINOIS, U.S.A.

Norton, Inc., Moves to New Quarters

NORTON, Inc., Milwaukee welding equipment distributor, moved on Nov. 10 to its new office and warehouse at 3876 N. Port Washington Rd. According to President Roy Norton, the new building will be headquarters for three divisions of the company: welding, safety and industrial supplies. In addition, there will be an extensive welding service and repair department.

Norton, Inc., recently became a distributor for Norton Co.'s abrasive products and for A. O. Smith Corp.'s welders, electrodes and accessories. The firm serves a trade territory embracing a radius of about 100 miles from Milwaukee.

* * *

Union Carbide Sets Up Scholarship Program

A SENIOR-YEAR technical scholarship program has been established at 41 engineering colleges and universities by Union Carbide and Carbon Corp., New York City. The program went into effect this fall and includes one or more such scholarships at each of the participating schools. The grants are individually sponsored by various divisions of the corporation and cover full tuition for a student's senior year. In addition, each student receives $200 for necessary books and fees.

* * *

Metallizing Increases Life of Piston Rods

A LEADING manufacturer of Diesel and gas engines and compressors now metallizes all new piston rods that are to work in an atmosphere of corrosive gases. The rods are now made of carbon steel and protected by spraying on a layer of stainless in the process of manufacture.

According to the Metallizing Engineering Co., Inc., Long Island, the procedure on one size of rod is to undercut 42 in. of the 3-in. diameter portion of the shaft by 0.030 in. on the radius. The shaft is then threaded 0.025 in. deep, 14 threads per in. These threads are prepared with a special shaft preparing tool and the surface metallized with stainless. An allowance of 0.025 in. is made for finish grinding.

See Possible Helium Shortage in Year

IF consumption of helium gas continues to increase at its present rate, there may be an actual shortage of it in about a year, according to the U. S. Bureau of Mines. Helium is produced at four locations in the Southwest by the Bureau, which sells it to government and industrial customers as well as to distributors of industrial gases. The sites are at Shiprock, N. Mex., Otis, Kan., and Amarillo and Exell, Tex.

The present boom in the demand for helium has put all plants into operation. In addition, the government has been forced to tap the 88,000,000 cu ft that it stores for slack years. About 80 to 90% of the industrial use of the inert gas is for welding, where it helps to join such metals as aluminum, magnesium and stainless steel.

During the past several years, about 30% of the helium production has gone to industrial users, the rest to the government. A survey two years ago by the Bureau of Mines revealed that 88% of the industrial helium was used on government contracts. A more recent survey (four months ago) showed the figure had dropped to 85%.

* * *

Fairless Works Starts Producing Weld Pipe

PRODUCTION of continuous weld pipe was recently started at the Fairless Works of National Tube. Initial operation at the U. S. Steel Division plant was attained with the rolling of 1½-in. diameter pipe on the first of two continuous weld mills.

The skelp mill, which produces products for pipe manufacture, is also in operation. Facilities at National Tube include the skelp mill, the two continuous weld mills for producing pipe from ½ to 4-in. in diameter, galvanizing and finishing departments and a 30,000-ton capacity warehouse. The plant has an annual capacity of 281,000 tons of pipe.

* * *

Jackson Welding Supply Opens Branch Office

A BRANCH office was recently opened at Adrian, Mich., by the Jackson Welding Supply Co., Jackson, Mich. The store, located at 1028 Railroad Ave., will handle welding and cutting gases, arc welders and electrodes. It will serve firms in Hillsdale and Lenawee counties. Negotiations are under way for a franchise in Monroe county to be handled from the Adrian store.

lightweight fully insulated

CADDY

TYPE B Electrode Holders

Connected by the CADWELD PROCESS—
the greatest advancement in arc welding
in 20 years.

Complete CADDY Catalog on Request

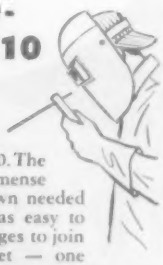
CADDY ARC WELDING
ACCESSORY DIVISION
ERICO PRODUCTS, Inc.
2070 E. 61st PLACE, CLEVELAND 3, OHIO

8'4" x 44" galvanized manifold welded with Ampco-Trode 10

Long-lasting, tough welds on galvanized sheet

a cinch with

AMPCO-TRODE* 10



Here's another tough job solved with Ampco-Trode 10. The fabricators of the immense air duct system shown needed an electrode that was easy to apply at low amperages to join galvanized iron sheet — one that had mechanical properties similar to the base metal. They needed a deposit that resists atmospheric corrosion and corrosive fumes. Ampco-Trode 10 passed all these requirements easily.

And that's not all! Here are the other advantages you get by welding galvanized sheet with Ampco-Trode 10.

1. Lower amperages mean minimum burn-off of the zinc coating adjacent to the weld. You get maximum corrosion-resistance.
2. Weld metal is free-flowing and easy to handle — practically no undercutting.
3. Deposit has high strength and ductility — provides good bond.
4. Burn-through is practically eliminated. Deposit is smooth — looks good.

Use Ampco-Trode 10 on your next galvanized welding job for lower costs, faster-welding, top-grade deposits. Check with your Ampco distributor or write us today.

*Reg. U. S. Pat. Off.

AMPCO®

W-123

AMPCO METAL, INC.

Dept. WE-12 • Milwaukee 46, Wis.

West Coast Plant, Burbank, California

Berryllium Corp. Offers Non-Beryllium Alloys

FOR the first time, The Beryllium Corp., Reading, Pa., is manufacturing alloys that contain no beryllium. These alloys are zirconium magnesium, manganese aluminum and titanium manganese aluminum. They are being produced on a trial or market-testing basis in order to determine whether the demand warrants production on a commercial scale.

Zirconium magnesium is an oxygen-free hardening material with a zirconium content of 30 to 40%. It is designed for use in producing magnesium alloy castings.

Manganese aluminum consists of equal parts of each element and is offered principally as a manganese additive to titanium alloys. It is also said to have possibilities in the aluminum alloy field.

Titanium manganese aluminum consists of 40% titanium, 30% manganese and 30% aluminum. It is aimed at introducing combinations of these metals in proportions designed to bring out useful and possibly new properties.

* * *

Dimitri Soussloff Wins Top Lincoln Award

DIMITRI Soussloff, associate director of research for Universal Winding Co., Providence, received the $2,931 first award in the program for welded-machine designs sponsored by The James F. Lincoln Arc Welding Foundation. He described a yarn-twisting machine, parts of which were redesigned for welded construction.

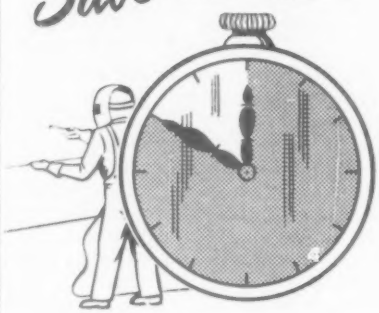
Second award of $2,682 was made to David W. Kinney, chief engineer for Pattin Mfg. Co., Marietta, O. He described a special machine made to mechanize an unsafe and expensive hand grinding operation on wedges used in bolting mine roofs. Robert J. Neville, vice-president in charge of manufacturing for North American Mfg. Co., Cleveland, received the $2,385 third award for his description of the redesign for welded construction of industrial-type gas and oil burners.

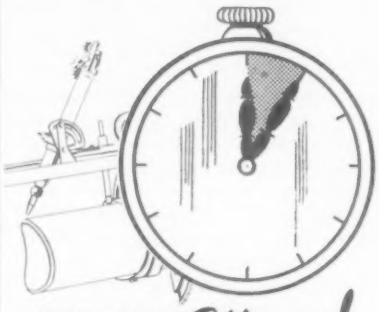
* * *

Distributor Offers Service to Firemen

CHECKING and weighing of carbon dioxide containers and fire-fighting equipment is a monthly service offered to its customers by Mid-Jersey Equipment Co., welding supply distributor of Livingston, N. J. One of the customers taking advantage of this service is the Livingston fire department.

Save THE TIME...





COUNT THE Money!

90% TIME SAVING ON ALL PIPE SHAPE-CUTTING

Reports from welders all over the country back up the claim that with the H & M Shape-Cutter and Beveler you can save at least 90% of the time spent hand-cutting Ells, Tees, Y's, Saddles, and other irregular shapes. Mr. Welder, THAT'S A SAVING WORTH LOOKING INTO!! Every minute you can save means more profit dollars in your pocket. It also means that you're in a lot better position when the seals are broken on those pipe fabrication competitive bids. Here's how the unique H & M works: (a) First you mount the desired pattern on your H & M Cutter; (b) Next, slip the split, horseshoe-shaped gear over the pipe; (c) Snap the machine in place with the spring-tension chain fasteners; (d) Light and adjust the torch; (e) Give the hand-crank a few turns — that's all there is to it. For the full story on the H & M

WRITE FOR THE FREE FOLDER "MORE PROFIT DOLLARS IN PIPE FABRICATION"

H&M PIPE BEVELING MACHINE CO.

Trade Mark Reg. U.S. Pat. Off.

311 E. 3rd. St. • Ph. 3-0241 • Tulsa, Ok.

New Slab Mill Completed Ahead of Schedule

GREAT Lakes Steel Corp. recently completed a new slab mill at its Ecorse, Mich., site—two months ahead of schedule. Ecorse is in the Detroit area. The mill's annual capacity of 4,000,000 ingot tons is about 25% of the automotive industry's total needs.

* * *

G-E Conducts Training Schools for Distributors

TRAINING schools for service engineers were recently held on the Pacific Coast in conjunction with demonstrations of General Electric Co.'s "Fillerarc" welding equipment to its distributors. One meeting was held in Portland, Ore., the other in Los Angeles. Present were engineers from Victor Equipment Co., The Galigher Co., Consolidated Welding Supply, J. E. Haseltine & Co. and Industrial Air Products.

C. L. McGuffie, manager of marketing for the G-E Welding Department, was present at both meetings.

* * *

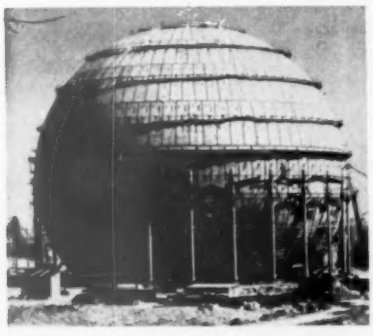
Russians Weld Crane With 350-Ton Capacity

A BIG new bridge-crane built for a Russian foundry features an all-welded bridge, according to *Izvestia*. The bridge is nearly 66 ft long and more than 39 ft wide. It was built in the Stalin factory at Kramatorsk. According to the newspaper account, welding signficantly decreased the weight of the crane over comparable riveted equipment.

—*McGraw-Hill World News*

* * *

Atom Apple Completed



JULY issue of THE WELDING ENGINEER carried a story on the construction of the "Atom Apple," a sphere as high as an 18-story building. It houses an atomic power plant for submarines outside of Schenectady. The completed "Apple" is shown above. It is made of 1-in. thick steel plates joined together by more than five miles of welding.

BERNARD

(PIONEER FOR MODERN WELDING)

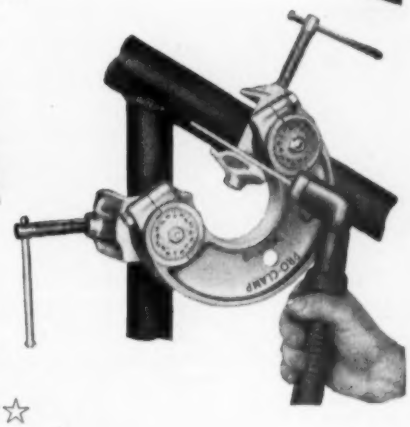
"Shortstub" ELECTRODE HOLDER

The jaws substitute for stub waste by splicing a 2 inch extension to the length of every electrode.

☆

"Pro-Clamp" MECHANICAL HANDS

MODERNIZE the fabrication of plates, shapes, rods, bars, pipes, etc. MAKE fitting, positioning, holding, and welding a fast, accurate, inexpensive, one-man job.



☆

"Multi-Pic" CONTOUR CLEANER

Delivers FIVE surface cleaning blows with each swing and lasts FIVE times longer than single headed hammers.

HAS **5** CONTOUR FORMING HEADS WHICH MEANS 5 TIMES FASTER CLEANING ACTION.

See Your Local Dealer, or, Write for Bulletins, SS-3, MP-6 and PCB-6

Manufactured By

BERNARD WELDING EQUIPMENT CO.

10232 AVENUE N, CHICAGO 17, ILLINOIS

Reducing a 12-day job to 2 days . . . with the ARCAIR TORCH

ARCAIR cut labor costs more than 80% on a recent job for Seidelhuber Iron & Bronze Works of Seattle, Wash., removing mild steel welds in one-sixth the time required with a chipper.

A change in requirements on three steel trash racks being built for McNary Dam left Seidelhuber with the job of removing 167 cross members on each rack. These cross pieces were triple welded with 4½ inch double fillet welds.

Two men with a chipper took three full days to strip one rack, plus the help of an extra man sharpening chisels. The remaining two racks were stripped by one man using an ARCAIR Torch. The job was completed in two days at a labor saving of 80 man-hours.

In addition to the time saved in actual removal of the welds, the job done by the ARCAIR Torch required far less grinding to prepare the surface for rewelding. The ARCAIR method slashed operating costs too . . . expenses amounted to $8 worth of electrodes plus the operation of a welding machine and air compressor.

Said the leadman on the job, "The ARCAIR Torch is faster than any other method I know of for leaving a smooth surface with little grinding. It's worth the expense even for one job."

Write for Free Bulletin with facts and photographs of other time and money-saving applications of the ARCAIR Torch. Arcair Company: *EASTERN DIVISION*, 423 So. Mt. Pleasant Ave., Lancaster, Ohio; *WESTERN DIVISION*, P. O. Box 4107, Bremerton, Wash.

Arcair TORCH

Cuts all metals—using only electric arc and compressed air

Welding Supply Luncheon Attracts 54 Members

FIFTY-FOUR active and associate members of the National Welding Supply Association attended an informal luncheon meeting at the Hotel Cleveland, Cleveland, Oct. 22, during the week of the Metal Show. NWSA President William A. Rice and Vice-President James N. Alcock addressed the group.

* * *

Alcoa Tests New X-Ray Development

IN cooperation with General Electric Co.'s X-ray department and The Haloid Co., Aluminum Co. of America is field testing a new technique in X-ray —Xeroradiography (pronounced "zeroradiography"). Alcoa will use it in the inspection of castings.

The advanced X-ray technique employs a reusable dry plate to record the image. Xeroradiography uses static electricity, much the same as a comb does in picking up a piece of paper. The static electricity arranges a fine-grain powder on a specially coated aluminum plate and produces an image similar to that on an X-ray film. With this new process, an image is available for viewing within 45 seconds. Conventional X-ray film requires one hour to develop and dry for viewing.

* * *

By-Product Iron Ore from Nickel Ores

PRODUCTION of by-product iron ore from nickel ores in the Sudbury district of Ontario has been undertaken by The International Nickel Co. of Canada, Ltd. The firm has begun construction of a $16,000,000 plant in the Copper Cliff area. The operation is expected ultimately to yield about a million tons of high-grade iron ore per year, in addition to nickel.

* * *

Sealing Water Main

WROUGHT iron water main of 12-in. diameter is installed under the "Big Four" tracks of the New York Central Railroad, Cleveland. Weldor is shown sealing coupling end to guard against leakage.

W-AL-CO RODS
for Welding of
ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
TYPES 25, 43 and 52
Brazing 718

Aluminum Solder

White Metal

WELDING ALLOYS
MANUFACTURING CO.
744 Broad St., Newark 2, N. J.

WELDERS' CLAMPS

HARGRAVE
Tested Tools
THE CINCINNATI TOOL COMPANY

Each Tool Is Individually Power - Tested

Ask for CATALOG showing the most complete line of CLAMPS. Stock sizes from ¾" to 12' opening ½" to 16" deep.

THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

Planett Mfg. Co. Named to Wire Reinforcement Institute

THE Planett Mfg. Co., Downey, Los Angeles, was named a member of the Wire Reinforcement Institute at that group's fall meeting held at the Greenbrier Hotel, White Sulphur Springs, W. Va. Purpose of the Institute is to conduct research into the use of welded wire fabric and to inform engineers, architects, contractors and the public alike about its new and improved applications.

* * *

Bridgeport Brass Opens Office in Grand Rapids

THE opening of a new sales office in the Federal Square building in Grand Rapids to serve western and southwestern Michigan has been announced by the Bridgeport Brass Co., Bridgeport, Conn. The new office will be under the direction of Thomas H. Williams, who was formerly with the company's Indianapolis sales office.

* * *

New Savannah Plant for Titanium Dioxide

TITANIUM dioxide pigments will be manufactured in a new American Cyanamid Co. plant under construction in Savannah, Ga. The plant is being built by Chemical Construction Corp., a subsidiary of American Cyanamid, and represents the fourth major construction project being carried out in the South by the former. Calco Chemical Division will operate the plant.

* * *

Distributor Appointments

C. B. Herrick Co., Cleveland: Essex Welding Equipment Co., Inc., Newark.

United Wire & Supply Corp., Providence: Hubbell Metals, Inc., St. Louis, for United's silver brazing alloys and fluxes.

North American Philips Co., Inc., Mount Vernon, N. Y.: Airframe Supply Co., Akron, O.

Minnesota Mining & Mfg. Co., St. Paul: Micro Deburring Co., Chicago; Mechanical Finishing Co., Cincinnati; Metals Finishing Corp., Hazel Park, Mich.; Metal Parts Processing Co., Newark; Metal Finish, Inc., Newark; M. E. Baker Co., Cambridge, Mass.; Deburreo, Inc., Philadelphia; Gerell Mfg. Co., Cleveland; Mosher Co., Chicopee, Mass.; Precision Tumbling & Supplies Co., Stratford, Conn.; Sundmark Supply Co., Los Angles; Tumbling Products, Inc., Indianapolis, for 3M's "Honite" barrell finishing abrasive chips, compounds and equipment.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

For Welding and Cutting . . .

NATIONAL CARBIDE

in the red drum

HIGHEST QUALITY
DUST FREE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

FAST ON-THE-SPOT REPAIRS

With This Portable Welder!

It's WISCONSIN Powered!

This inexpensive "Lincwelder", made by Lincoln Electric Co., Cleveland, O., is easily mounted on running gear or truck for welding service anywhere.

Welding at the breakdown-scene . . . adds up to savings in time and labor with this light but rugged 180 amp. Lincoln Welder, powered by a two-cylinder Wisconsin Heavy-Duty Air-Cooled Engine.

The performance satisfaction of Wisconsin Engine power increases not only the reliability of equipment in all fields, but also increases the confidence of both equipment user and builder. They're sold on such features as self-cleaning, thrust-absorbing Timken tapered roller bearings at both ends of the crankshaft . . . fool-proof air-cooling, from sub-zero to 140°F . . . an easily serviced OUTSIDE rotary type, high tension magneto with impulse coupling, for quickest any-weather starts . . . plus heavy-duty construction, inside and out.

Your investigation is invited! 3 to 36 hp., 4-cycle single-cylinder, 2-cylinder, and V-type 4-cylinder models.

WISCONSIN MOTOR CORPORATION

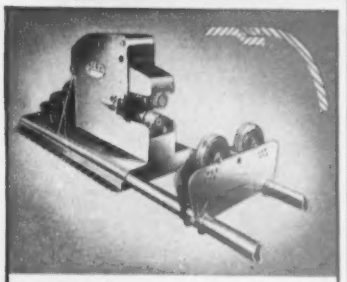
World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46 WISCONSIN

REED
ENGINEERING CO.

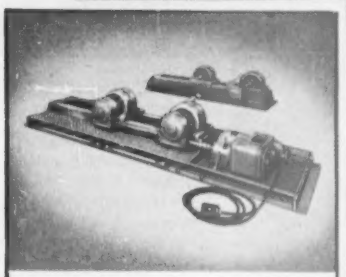
Modern
Metalworking
Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



REED OFFSET FORMING MACHINE

- ★ Improves automatic welding production by eliminating chill-rings and backing bars
- ★ Forms offset weld-backing joggle from tank shell
- ★ Loosens rust and mill scale
- ★ Improves shell roundness
- ★ Two models: M-2—1/16 to 3/16" plate
  M-4—3/16 to 7/16" plate



REED PORTABLE TURNING ROLLS

- ★ In 5 models; capacities up to 75 tons
- ★ For hand or automatic welding, finishing operations on tanks up to 14 ft. diam.
- ★ Reversible, variable speed adjustment
- ★ Rugged, all-steel construction
- ★ Built-in silent worm gear drive

WE INVITE YOU . . .
to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

BOOK Reviews

Weld Specifications

WELD STANDARDS. Published by The Lincoln Electric Co., Cleveland 17, 1953. Paper, 8½ by 11 in., 19 sheets on tracing paper in looseleaf binder. Price $1 per set.

This volume is based on procedures developed by The Lincoln Electric Co. and the weld symbols of the American Welding Society. For a specified plate thickness, "Weld Standards" gives the electrode type and size, the polarity and current, electrode melt-off rate, arc speed, number of passes or beads, feet of joint welded per hour and the pounds of electrode required per foot of weld. All of these factors are specified by using the simple letter designation set forth in the volume in conjunction with the regular AWS symbol.

It is recommended that both engineering and shop use the same standards and both have copies of them available for reference. Then the engineer can be assured that the weld he has specified will be made to produce the results for which it was designed. The shop can be assured that it is making the weld desired and according to specifications for economy, strength and appearance. When the information in "Weld Standards" is followed, the use of the procedure designated for a specified plate thickness will result in a weld equal to the plate in section and strength.

* * *

Technical Papers

PROCEEDINGS OF THE NATIONAL ELECTRONICS CONFERENCE, 1952. Vol. 8. Published by National Electronics Conference, Chicago 19. Cloth, 6¼ by 9¼ in., 835 pages. Price $5.

This book contains all of the technical papers presented at the 1952 National Electronics Conference. The 97 papers cover various phases of electronic research, development and application. Among the topics listed are: antennas, the assembly and measurement of components, audio circuits, coding and recording techniques, computers, delay lines and high-frequency test equipment, electronic instruments, engineering management, industrial measurements, semiconductors, servomechanism, television, transitors and wave guides.

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SELL
USE

SHAWINIGAN
CARBIDE

SHAWINIGAN
PRODUCTS
CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

How easy can you get? If you can hold a wrench and a screw-driver you can put a new seat in a SMITH'S REGULATOR in just a few minutes time. No special tools—no special skills—no long delays. That's why experienced welders pick SMITH'S REGULATORS.

SMITH WELDING EQUIPMENT CORPORATION
Dept. WE-91, 2633 S.E. 4th St., Minneapolis, Minn.

Research Findings

WELDABILITY OF STEEL. By Robert D. Stout and W. D'Orville Doty. Published by Welding Research Council, New York City 18, 1953. Fabrikoid, 6 by 9 in., 381 pages. Price $6.50.

The weldability of carbon and low-alloy steels is at once one of the most interesting and one of the most challenging of engineering problems. During the past 15 years, it has engaged the attention of hundreds of investigators. Hitherto, however, there has been little opportunity for an overall analysis and interpretation.

The Weldability Committee of the Welding Research Council realized that these experimental results, if they were to be of practical use to welding and design engineers, should be summarized in one volume. Accordingly, Messrs. Stout and Doty were commissioned to prepare a critical analysis.

The early chapters of this monograph cover briefly the fundamertals of welding processes and metallurgy in relation to the weldability of carbon and low-alloy steels. Suggested methods for welding commonly used steels are then presented. The remaining chapters contain a review and critical evaluation of weldability tests and general conclusions on our knowledge of weldability.

Probably the most useful part of the book is an appendix consisting of 50 pages of tables. All of the standard specifications for steels, such as ASTM, SAE, ABS and others, are classified into three categories: (1) those readily weldable, (2) those in which some precautions are needed and (3) those requiring special precautions and considerations.

* * *

Why Cracking?

WELDABILITY TESTS OF HIGH TENSILE STEEL. (PB 109268). 37 pages. Microfilm $2.25; photostat $5. Order from Library of Congress, Publication Board Project.

This booklet by the Naval Research Laboratory tells why cracks appear in the heat-affected zones when steel of the manganese titanium-treated types is welded and shows how far weld deposits can be held responsible.

The volume begins with a review of fundamentals such as the chemical composition of the steels, their end-quench hardenability and the results of bend and nick-bend tests of weld bead. This is followed by a discussion clarifying the reasons for cracking and justifying the conclusions reached. Also, the weldability of these materials is evaluated.

Faster because Atlantic Speed-Tested Grinding Wheels feature a smooth, floating action that requires less pressure, reduces fatigue and speeds up snagging from start to finish.

Safer because every Atlantic Wheel made — from the 2 inch size on up — is test run at a 50% higher speed than that required for normal snagging conditions . . . safer because every wheel features a special Resinoid Bond for extra strength and long life under high operating speeds.

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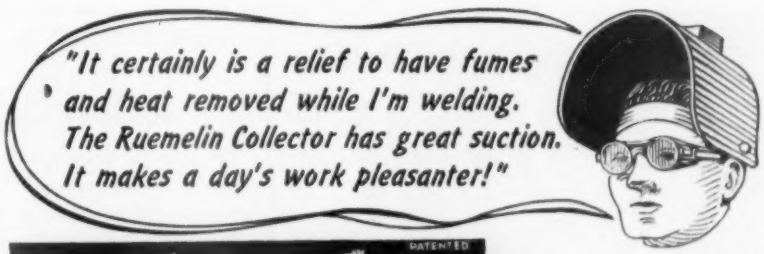
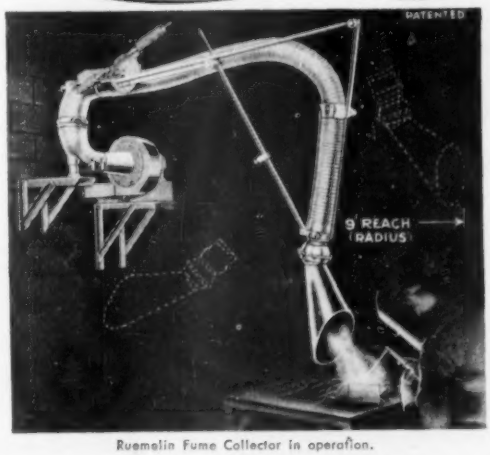

"It certainly is a relief to have fumes and heat removed while I'm welding. The Ruemelin Collector has great suction. It makes a day's work pleasanter!"



Ruemelin Fume Collector in operation.

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated at their source, thus improving working conditions, lessening fatigue and paving the way for increased plant production.

The Ruemelin Fume Collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustments necessary. Just pull the inlet hood to the welding position and you are ready to go.

Note the new spring-loaded counterbalance mechanism which makes Fume Collector much easier to handle. Ask for Bulletin 37-E illustrating this new feature.

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SAND BLAST AND DUST COLLECTING EQUIPMENT
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OFFICES: KANSAS CITY, GRAND RAPIDS

HOWARD W. BOYNTON, vice-president and treasurer of Handy & Harman, refiners and fabricators of precious metals, recently celebrated his 50th anniversary with the company. A dinner, attended by 110 persons, was held in his honor at the Waldorf-Astoria Hotel. Mr. Boynton joined the company in 1903, at the age of 13. Since that time, he rose from office boy to his present executive position. He is also a member of Handy & Harman's board of directors and executive committee.

* * *

C. E. MACDONALD of The International Nickel Co. of Canada Ltd. has been named chairman of the Canadian Welding Bureau by the Canadian Standards Association. He succeeds D. S. LLOYD, vice-president and general manager of Dominion Oxygen Co. Ltd., and COL. A. H. COWIE, founder chairman of the Bureau and general manager of Dominion Bridge Co. Mr. Macdonald is Inco's manager of Canadian sales and development. The Bureau was organized in 1947 to assist fabricators in meeting welding conditions of CSA codes.

* * *

PETER S. BLAKE has been appointed works manager of A. O. Smith Corp.'s new automotive frame plant now under construction at Granite City, Ill. He formerly was factory manager of the truck frame division at Milwaukee. The new plant is expected to be ready for initial production by early summer of 1954.

* * *

W. ALEXANDER MCCUNE, JR., has been named general sales manager of Norton Co. of Canada, Ltd., succeeding C. W. FELL. Ill health has caused Mr. Fell to take a less strenuous part in the company's sales program. Mr. McCune was formerly an abrasive engineer in the northern New Jersey area. WINTON A. VAGEDES has replaced him in that capacity.

HOWARD H. FOSTER has been elected treasurer of Air Reduction Co., Inc., succeeding WILLIAM WINTERS, JR., who retired recently after more than 35 years of service. Mr. Foster has been with the company since 1933, serving in various sales and management capacities. He had been assistant treasurer since February.

* * *

ELMER J. LELL has been named sales manager for Wall Colmonoy Corp. He joined the company in 1948 as midwest sales engineer. His most recent position was assistant sales manager. Mr. Lell spent several years in the heat treating, materials handling and steel erection industries before coming to Wall Colmonoy.

* * *

Four appointments were recently announced by Union Carbide and Carbon Corp. DR. RAYMOND W. MCNAMEE was named manager of the research administration; DR. BRUCE J. MILLER was appointed assistant manager. DR. FRANKLIN JOHNSTON was named to succeed Dr. McNamee as superintendent of the research and development department. DR. HENRY C. CHITWOOD was appointed assistant director of research, organic chemicals.

* * *

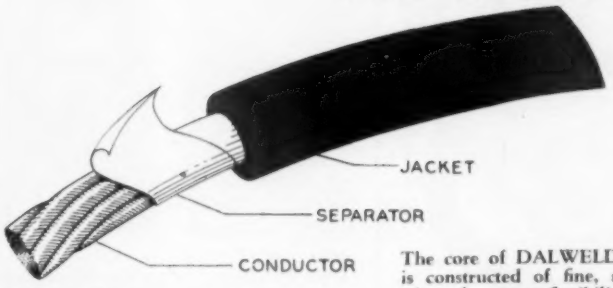
Five engineering promotions were recently made by Worthington Corp. EVERETT C. SCHMACTENBERG was appointed chief engineer of the turbomachinery engineering services. C. J. TULLO was named chief engineer of the centrifugal engineering division. WARREN H. FRASER and WILLIAM C. KRUTZSCH were appointed assistant chief engineers of the centrifugal engineering division. MAX REIMER was named chief draftsman of the Harrison Works engineering department and manager of the engineering services division.

* * *

T. B. JEFFERSON, editor of THE WELDING ENGINEER, was guest speaker at the Oct. 26 meeting of the Jacksonville, Fla., chapter of the American Society for Metals. On the same day, Mr. Jefferson appeared on television station WMBR-TV in a 15-minute interview on "The Importance of Welding to the Average Citizen." Tommy Tucker conducted the interview. It was the first time that welding was discussed on a TV program in Jacksonville.

DALWELD Super-Flexible Welding Cable is NEOPRENE Covered

FOR LONGER LIFE



Why Neoprene?

Neoprene is more heat resistant. It also resists hydrocarbons and oils which attack natural rubber—and all common inorganic acids and alkalies. Therefore it stands up under the most severe welding conditions. The Neoprene compound used on DALWELD Welding Cable is tough, durable and flexible, and conforms to ASTM Specification D-752.

The core of DALWELD Welding Cable is constructed of fine, soft bare copper wires, for super-flexibility. The jacket is a special Neoprene compound which is most resistant to all wear conditions. Yet DALWELD costs no more than ordinary rubber covered cable. Write today for complete price information.

Dealer inquiries invited

DALWELD COMPANY
1 Bertel Avenue, Mount Vernon, N. Y.

New One-Package DryRod Electrode Oven

Gives ON-THE-JOB Protection for Low-Hydrogen and Stainless Steel Rods!

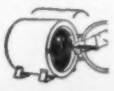
NOW YOU CAN HAVE full protection on scattered, isolated jobs for your low hydrogen, stainless steel or other special alloy electrodes . . . with new bantam-size Model 10 DryRod Electrode Oven! Lightweight, Model 10 goes everywhere operator can work . . . holds full 10-lb. package of 14" rods . . . protects against moisture absorption with even, continuous flow of heat. Saves on costly rejects, reworks, scrap loss just like larger DryRod Models—Yet costs less than $50, fully wired, 110-volt AC! Ideal for large, diversified plants and shipyards . . . oil fields and construction jobs . . . installation on mobile service units . . . or as regular unit in smaller shops. See your dealer, or write for full information TODAY!

DryRod—Trademark—X-DR-15

Portable Unit Saves 4 Ways Like Other Models:

1 Store sealed cartons in warm, dry place.

3 Locate DryRod as close to welding operations as possible.



2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF **Phoenix Products Co.**
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2 IMPORTANT AIDS FOR WELDERS!

USE YOUR FOOT instead of your head!

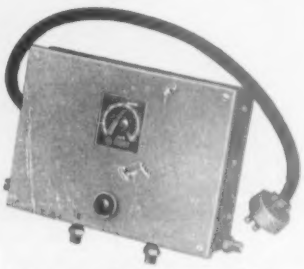
Mullenbach ARCTROL

Makes all welding easier

Adjust heat *WHERE* you weld, *WHILE* you weld! Simply depress foot pedal until exact voltage is delivered. Portable, saves trips to welder; selects correct heat for each job variation. Does not affect range of welder—a *necessity* on precision welding, a *tremendous* advantage on production work. *Available for most makes of D.C. welders. Free circular, state welder make and model.*

Mullenbach GASTROL

Automatic gas-water control for inert gas (Heliarc) welding



- Saves up to 50% of argon or helium gas by limiting flow to welding and cooling periods!
- Increases tungsten electrode life!
- Saves operator's time and eliminates human forgetfulness!
- Makes better welds! Prevents condensation causing contaminated welds by stopping water flow during off-welding periods!
- Low in cost!

Ask for folder

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WILLIAM O. LIFTON has been appointed Chicago district manager for the Arcos Corp., Philadelphia, manufacturer of low hydrogen and stainless electrodes for welding.

* * *

CARL J. SAKS has been named sales director for the silver brazing division of Goldsmith Bros. Smelting & Refining Co., Chicago, producer of precious metals, mercury and lead. He has been with the firm since 1936, serving in various capacities. In recent years he has been associated with the silver brazing division.

* * *

LEROY H. WIESCHAUS has been appointed district manager of American Wheelabrator & Equipment Corp.'s Birmingham, Ala., sales office. A registered professional engineer, he has held various positions in the company's home office in Mishawaka, Ind.

* * *

DR. O. G. HAYWOOD, JR., has been appointed manager of engineering planning for Sylvania Electric Products, Inc. A former colonel in the Air Force, he is a graduate of the U. S. Military Academy at West Point and holds a master of science degree from Harvard University and a doctor of science degree from Massachusetts Institute of Technology.

* * *

JOHN S. CARR has been appointed manager of pump sales for American Manganese Steel Division of American Brake Shoe Co. A former sales engineer, he has been with the firm since 1949. His headquarters will be located at the Amsco plant in Chicago Heights, Ill.

* * *

The British Welding Research Association recently announced two appointments. DR. A. A. WELLS has been named chief research engineer and head of the engineering research station at Abington, near Cambridge. R. P. NEWMAN has been appointed chief administrative officer of the station.

Make More Money on EVERY Welding Job..

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We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage.

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WELDERS' GROUND CLAMPS

- *EXTRA STRONG*
- *FAST ACTION*
- *POSITIVE CONTACT*
- *HOLDS ANY SURFACE*
- *SPATTER PROOFED*

QLW SERIES

Grand quick setting Ground Clamps of NACO No. 6 Super Steel are first choice with welders. Available in 3 popular sizes.

2-QLW 200 Amps 1¾" Max. Opening
4-QLW 400 Amps 3⅜" Max. Opening
6-QLW 600 Amps 5⅛" Max. Opening

Famous GRAND "C" Clamps

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat – Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

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1 One piece back.
2 One piece palm.
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4 All vulnerable seams welted.
5 Palm side of thumb is protected by extra leather overlay.

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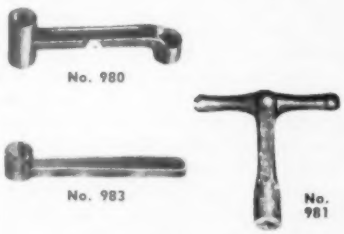
WRENCHES
For Acetylene Tanks



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SQUARE AND ROUND CAST IRON WELDING RODS AND ELECTRODES
"Flux-Well" Welding Fluxes
Sold Thru Leading Distributors
THE CHICAGO HARDWARE FOUNDRY CO.
"Dependable Since 1897"
NORTH CHICAGO, ILLINOIS

JAMES E. BUTLER has been appointed manager of product sales for the Franklin Balmar Corp., Woodberry, Baltimore. His offices are in New York City.

* * *

J. E. POOLE was recently appointed manager of manufacturing and engineering of The Liquid Carbonic Corp.'s compressed gas division. His headquarters are in the Chicago general office. Mr. Poole will assume complete responsibility for the design and operation of all liquid gas plants—carbon dioxide, industrial and medical.

* * *

MAJ. GENERAL K. D. NICHOLS has been named general manager of the Atomic Energy Commission. He succeeds MARION W. BOYER, who resigned. General Nichols was wartime district engineer for the Manhattan District, which developed the atomic bomb. He retired from military service when he took the AEC appointment.

* * *

HARRY F. PRAH has been appointed sales engineer for the Cecil C. Peck Co. His headquarters will be in Indianapolis, Ind. He has filled positions from junior engineer through tool engineer, chief inspector and plant engineer. Mr. Prah received his degree in industrial engineering from Fenn College. He has pioneered in galvanizing and welding techniques and is a member of the American Welding Society.

* * *

D. T. O'CONNOR, chief of the radiology section, U. S. Naval Ordnance Laboratory, White Oak, Md., recently received the first annual William D. Coolidge Award for the outstanding paper of the year on X-ray. The award was made jointly by the Society for Non-Destructive Testing and the X-ray department of General Electric Co. at the October meeting in Cleveland. DR. COOLIDGE himself was honored the same week on the occasion of his 80th birthday. He is former vice-president and director of research for G-E.

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HOW TO DO IT

Condensed Versions of ALL an Operator Needs to Know to Swing to

EASIER WAYS
of Welding, Brazing, Soldering, Tinning, Cutting
FREE!!

Which one do you want?

All-State Welding Alloys Co., Inc., White Plains, N. Y.

I've checked the "How to Use and Apply" folder I want.

■ DOC ALLOYS KIT—Generous sampler of 11 torch applied ALL-STATE alloys, 8 fluxes, 1 galvanizing powder.

■ ALUMINUM and ALUMINUM ALLOYS—World's most complete line of aluminum alloys and fluxes—ALL-STATE.

■ COPPER and COPPER-BEARING ALLOYS—10 ALL-STATE alloys and fluxes for work on copper and copper-bearing alloys.

■ STEEL—13 ALL-STATE alloys and fluxes for work on STEEL.

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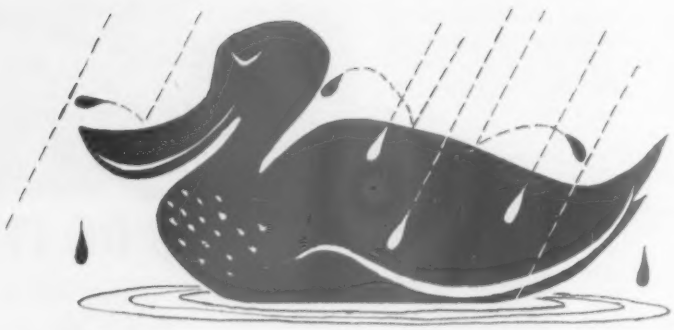

HOW TO DUCK THE WELD-SPATTER PROBLEM

Use Protect-O-Metal and weld spatter wipes off as easily as water from a duck's back! With Protect-O-Metal you speed welding and save up to 85% of weld cleaning time and labor. Brush or spray P.O.M. in weld seam and on adjacent metal—weld—then brush off spatter in seconds.

Just a little P.O.M. goes a long way too—costs less than 1/10c per foot of weld protected, saves up to three times its cost in time savings alone. Order a trial gallon ($3.25), satisfaction guaranteed or invoice will be cancelled.

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. . . makes the true difference!
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SPECIAL SHAPE
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Last so much longer on Tractor Grousers
. . . NICKEL is the element in MANGANAL which makes welding and fabricating easy. Insist on MANGANAL, the toughest metal known not harmed by heat.

FREE
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NEAREST DISTRIBUTOR UPON REQUEST

A. B. CAPRON has been named assistant works manager in charge of tube mills and engineering of The Babcock & Wilcox Co., Beaver Falls, Pa. He was formerly chief engineer, and joined the company in 1937 as a mechanical engineer. NEWELL HAMILTON, formerly superintendent of the steel mill, has been appointed manager of steel operations in the tubular products division of the company. Mr. Hamilton has been with the company since 1928.

* * *

WILLIAM F. GIBBS and DR. GEORGE C. NEWTON, JR., were recently honored by The Franklin Institute of Pennsylvania. Mr. Gibbs was awarded the Franklin Medal, the Institute's highest honor, for his efforts in the fields of naval engineering and architecture. This work ultimately led to the design of the vessel S. S. United States. Dr. Newton was awarded the Louis E. Levy Medal for his paper, "Compensation of Feedback-Control Systems."

* * *

Died . . .

FRED M. BURT, 56, contributing editor of THE WELDING ENGINEER, died suddenly Oct. 19. Mr. Burt, who was located in Los Angeles, had been associated with THE WELDING ENGINEER since 1945. He was well known to our readers through his many articles about welding activities on the West Coast. He also was a consulting engineer in production fields.

Prior to his association with THE WELDING ENGINEER, Mr. Burt was production engineer for Lockheed Aircraft and other West Coast manufacturers. A native of Illinois, he had resided in the Los Angeles area for the past 20 years. Mr. Burt is survived by his widow, Eleanor, two daughters and several grandchildren. THE WELDING ENGINEER has lost a valued member of its staff.

* * *

HERBERT D. TIETZ, 55, manager of sales for the Inco Nickel Alloys Department of The International Nickel Co., Inc., died suddenly Oct. 11. He had been associated with International Nickel since 1931. A native of New York City, Mr. Tietz was a veteran of World War I. He is survived by his widow, a daughter, one brother and one sister.

Wants Fumes Removed

Dear Sir:

We are considering installing an exhaust system for welding fumes similar to the types mentioned in your article "Fumes No Problem with Right Equipment" on pages 50 and 51 of the October issue of THE WELDING ENGINEER. We would much appreciate your forwarding information regarding the firms to contact for the types of systems illustrated.

Very truly yours,
Robert J. Garofalo
Vice-President
Wiretex Mfg. Co., Inc.
Fairfield, Conn.

* * *

Likes Mid-June Issue

Dear Sir:

I would like to express our appreciation for your mid-June "Product and Statistical Review Number."

For a number of years this has been our "Bible." It is in constant use, and we keep a copy at each order desk. It has enabled us to secure information on products that we do not handle and give our customers information and a source of supply. They have expressed appreciation of our ability to aid them, and we feel that it is this publication that enables us to help them.

You are to be congratulated on such a fine accomplishment.

Sincerely,

G. M. Sims
Absco Welding Equipment & Supplies
Los Angeles

* * *

Weldors' 10 Commandments

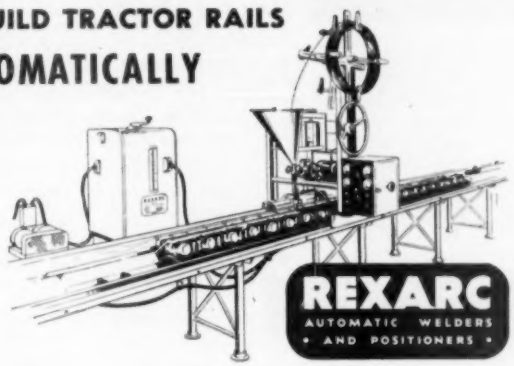
Dear Sir:

In the course of preparing a training manual for arc welding, I have found your magazine a valuable source of information.

In line with our policy of stressing the safety angle of welding, we have compiled the following Ten Commandments for Weldors:

(Continued on next page)

PROFITS ARE BIGGER WHEN YOU RE-BUILD TRACTOR RAILS AUTOMATICALLY



Welding on tractor rails and other longitudinal surfaces is fast and simple—with a Rexarc Automatic Welder. Here's automatic welding that is really automatic!

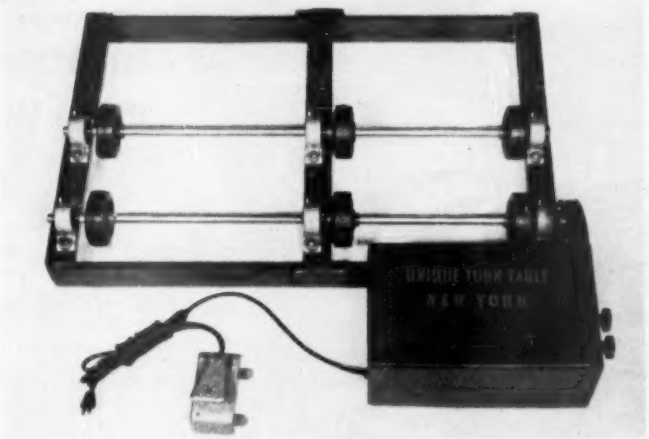
Operation is simple. Welding arc breaks at each joint and starts automatically at the next link, depositing new metal to the desired height. Metal is applied to the exact length and shape of the exposed link, leaving joints free. Cutting or grinding is virtually eliminated.

You save time. You save new metal. Your profits are bigger!

SEE YOUR DISTRIBUTOR, WRITE OR CALL

THE SIGHT FEED GENERATOR COMPANY
55 EAST THIRD STREET
WEST ALEXANDRIA, OHIO, U. S. A.

NEW! UTTCO TURNING ROLL
LOW COST, COMPACT, EFFICIENT



Every shop needs the new UTTCO Model 500 Turning Roll. Compact, it handles 90% of applications in large shops, releasing big equipment for big jobs. **Far lower in cost** than any on market, it puts automatic welding efficiency within reach of even the smallest shops. Reduces rejections, increases output, boosts profits.

Capacity 1" to 3' diameter, up to 500 lbs. Adjustable 3-wheel drive, variable speed. Used as floor or bench model. Sturdy channel construction, 2' x 3'.

Other models up to 75 ton capacity. Send specifications for quotation on your special requirements.

Sturdy channel construction
Frame 3 ft. x 2 ft.

DISTRIBUTORS:
Inquire for choice territories still open

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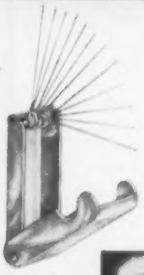
Welding Engineers prefer THERMO spiral tip cleaner design...



So do welders because they know how the spiral design of Thermo Tip Cleaners removes carbon and slag without scratching or enlarging. Buy Thermo Spiral Tip Cleaners in handy metal case. 12 sizes.

Precision manufactured and guaranteed unbreakable or replaced free.

SAVE 95.5% ON COVER LENS COST

Send for free sample of the Triple Duty Cover Lens and prove the above claim.

At all Welding Supply Dealers

THERMACOTE CO.
NEWARK • CHICAGO • LOS ANGELES

(1) Thou shalt not make undersize welds.

(2) Thou shalt screen thy neighbor as thyself.

(3) Thou shalt not cast away hot stubs where disaster shall be caused.

(4) Thou shalt not covet thy neighbor's welding machine, nor his tongs, nor his extension cable.

(5) Honor thy fillets and passes that they may endure long in the weldment.

(6) Thou shalt not cause molten spatter to descend down thy neighbor's neck.

(7) Thou shalt not employ thy tongs to light a gas torch.

(8) Thou shalt pull the switch of thy machine when not in use.

(9) Thou shalt not leave thy cable or deposit rods where thy neighbor shall trip over them.

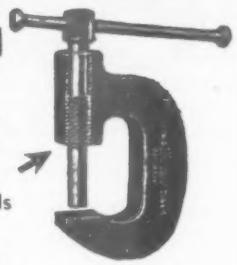
(10) Thou shalt not weld on any container that has held inflammable liquids, gas or vapors, or thy days will not be long in the land of thy fathers.

Yours very truly,

Jim Spark
Special Assignments
Canadian General
Electric Co. Ltd.
Toronto 4, Ont.

"Red Head"
WELDING CLAMPS

- Designed for Welding
- No Threads To Damage



1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

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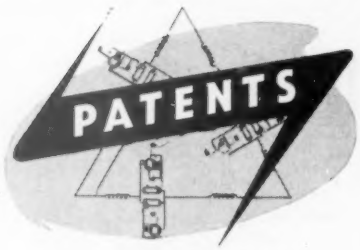
Here are 40 pages of vital information, answering questions which have been bothering you for a long time.

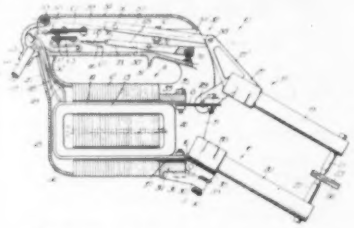
For CHAMPION performance you need a Champion electrode . . . why use ordinary electrodes when *CHAMPIONS* cost no more?

THE CHAMPION RIVET CO.
CLEVELAND 5, OHIO • East Chicago, Ind.



Portable Spot Welder

2,651,701. ARTHUR O. BACKEN, Chicago. Filed April 17, 1951. Granted Sept. 8, 1953.

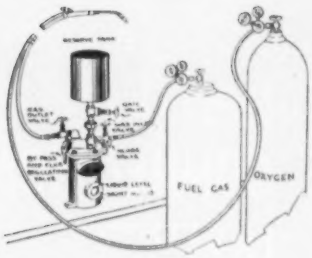


This patent covers a manually operated portable spot welder. Its transformer has a core formed by a stack of laminations of magnetic material with primary and secondary windings extending throughout. A frame is secured to the core. A pair of welding jaws is connected to the secondary winding. The jaws are carried by the frame and mounted for movement toward and away from each other to engage the work between them. An operating lever is pivoted on the frame. A link connecting the lever and one of the jaws forms a toggle joint. This joint is arranged to be substantially extended when the jaws engage the work. The welder also includes a switch, carried on the frame, for connecting the primary winding to a source of alternating current. This switch includes a pivotally mounted contact member and a coöperating contact member. A control lever is pivoted intermediate its ends on the frame, with one end arranged to swing past the pivot axis of the pivotally mounted contact member. The other end is operatively connected to the operating lever. A coil tension spring interconnects one end of the control lever and the pivotally mounted contact member for shifting the same with a snap action into and out of the engagement with the cooperating contact member. This occurs on swinging movement of the control lever. A spring coöperates with the control lever to bias it in a direction opposite to that in which it is swung by the operating lever.

use

GASFLUX Brazing Process

and



(1) get rid of cleaning operations
(2) eliminate porosity and leakers
(3) increase your production rate

GASFLUX customers are making these savings. A manufacturer of high quality sheet metal cabinets turned to brazing to get rid of brittle welds and distortion, only to run into a costly flux removal problem. The GASFLUX process solved it.

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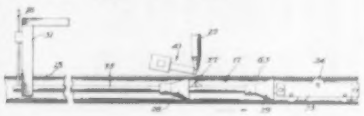
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. BOX 98-B, CINCINNATI 36, OHIO

Welding Stainless Tubing

2,654,014. WALTER S. SCHAEFER, Euclid, O. Assigned to Republic Steel Corp., Cleveland. Filed Feb. 19, 1948. Granted Sept. 29, 1953.



This patent refers to a method of welding a longitudinal seam in metallic tube blanks. Inert gas is injected into a certain portion of the interior of the tube blank. Confining the gas in this portion, an arc is struck against the seam at said portion. The heat of the arc is maintained solely by flow of an electric current, causing relative motion between the arc and the blank. The inert gas is injected in successive different portions, passing a magnetic field through the arc transversely to the arc and to the direction of the motion. The field is of such polarity in relation to the polarity of the arc current as to apply a force to the arc in a direction opposite to the relative direction of motion of the blank. It is of insufficient strength to hold the arc vertical but sufficient to hold the arc substantially erect with a slight arc trail. The arc is thereby electromagnetically deflected in a direction opposite to the relative direction of motion of the blank. The angle of arc trail is thus diminished, and the seam is welded by a stabilized arc as the blank progresses relative to the arc. This notwithstanding the inert condition surrounding the arc, because the arc is strained electromagnetically to prevent wandering.

* * *

Electrode Production

2,653,878. JOHANNES SEJERSTED and OLUF C. BOCKMAN, Olso, Norway. Assigned to Elektrokemisk A/S, Oslo. Filed Nov. 18, 1949. Granted Sept. 29, 1953.

This is a newly patented method for preparing mixes for use in electrodes. Bituminous pitch is selected as a binder material, and a sample of the mtaerial is carbonized at approximately the temperature at which the electrode is to be carbonized. The reactivity of the sample to carbon dioxide is tested. The method includes calcining dry material selected from the group consisting of pitch coke, petroleum coke and purified anthracite at a temperature below 1,200 C and at a temperature low enough so that the reactivity to carbon dioxide is at least 75% of the reactivity of the test sample. The dry material is then combined in a powdered form with the binder material.

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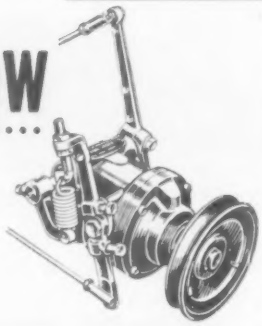

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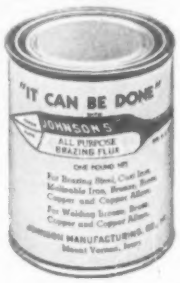
BRAZING FLUX



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1/8"	Alloyrod Armorarc	19-9	32,250
5/32"	Page	18-8	2,600
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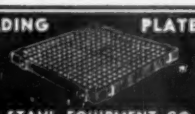

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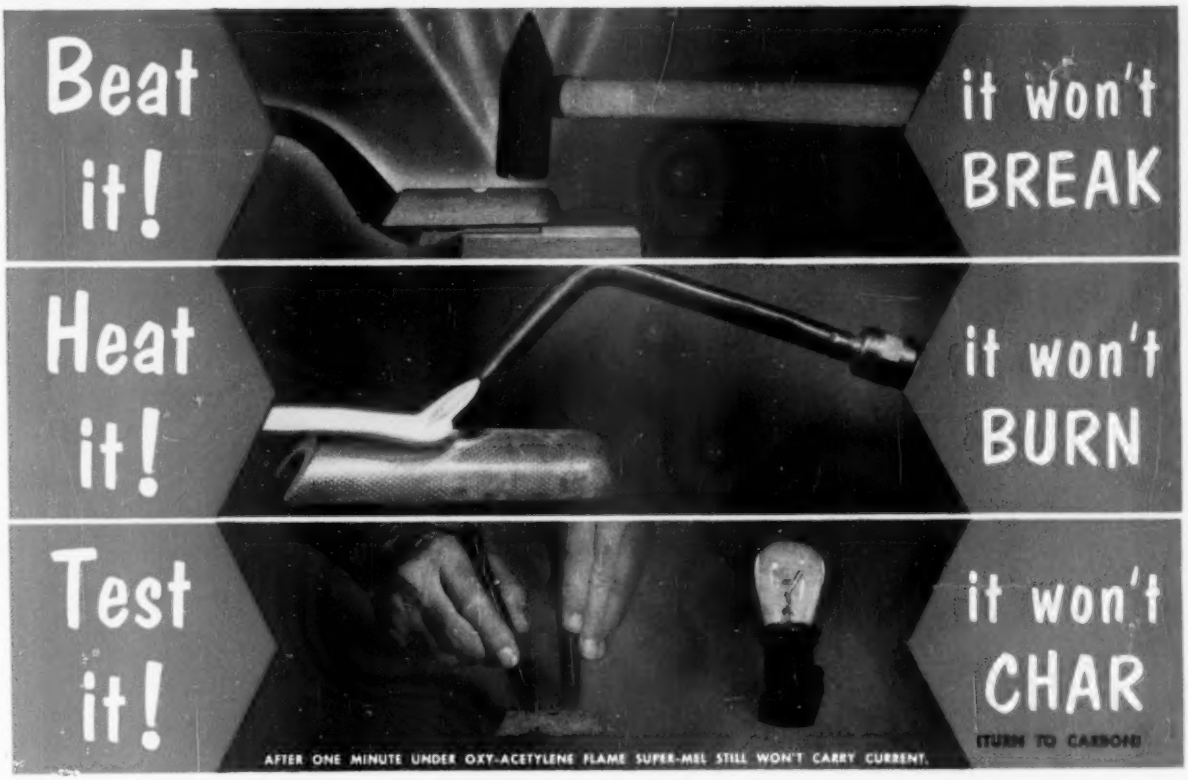
ONLY TWECOTONG HOLDERS HAVE "SUPER-MEL" INSULATION



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Only TWECOTONG Electrode Holders have "SUPER-MEL" insulation which is composed of thirty layers of continuous filament glass cloth impregnated with pure Melamine resin. Heat it for a full minute with the searing 6,000° flame of an oxy-acetylene torch. It won't deform and it won't turn to carbon which causes other insulation to carry current and short-out. Beat it with the full force of a heavy hammer. Its laminated strength will withstand repeated blows and prove its ability to take any normal shop or field abuse. Make these same tests on any other insulation on the market and you will see why so many users have switched to TWECOTONG with patented "SUPER-MEL" insulation.

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PRODUCTS COMPANY

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6000 hours longer life

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Available in 300-, 400-, and 500-Amp. models.

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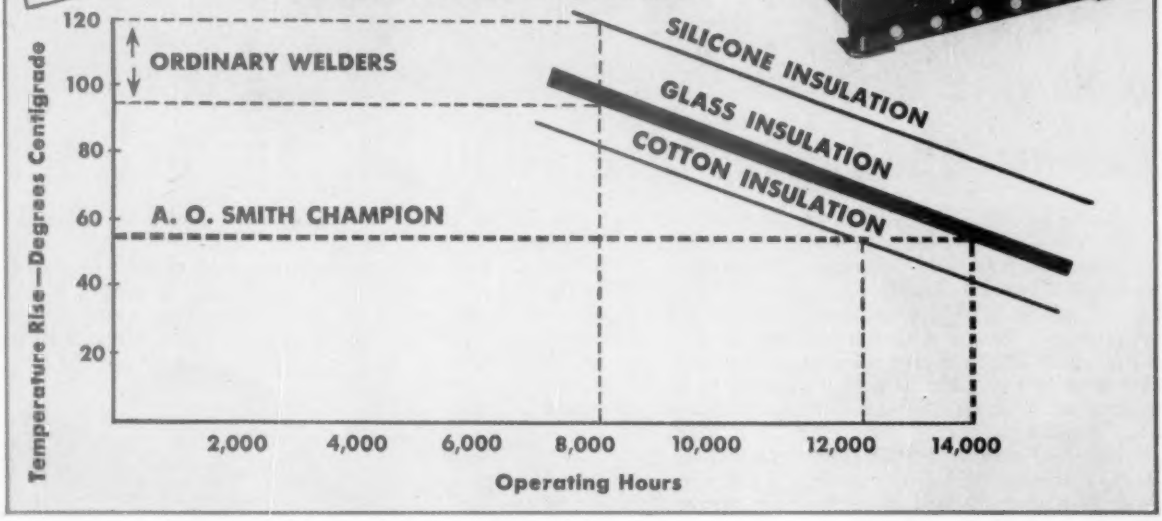
LIFE EXPECTANCY CHART



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The A. O. Smith Champion is the *only* A. C. welder on the market with enough copper and cooling capacity to operate without exceeding a 55° C. temperature rise—as compared to the 90° C. rise allowed by N.E.M.A. for glass-insulated welders.

This means: The Champion will give you top production efficiency almost twice as long as any other A. C. welder on the market today.

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For additional information on welding machines, electrodes and accessories, see your local A. O. Smith distributor or write to A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

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INTERNATIONAL DIVISION: MILWAUKEE 1
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